Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

Safety Engineering Policy Memorandum

SAFETY 1-06
Highway Safety Improvement Program (HSIP)
Effective November 1, 2006

INTRODUCTION

This policy supersedes Traffic policies, TRA-15 and TRA-16.

The federal bill reauthorizing surface transportation funding, titled "Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users" (SAFETEA – LU) has authorized a new core federal-aid funding program entitled "Highway Safety Improvement Program" (HSIP) beginning in federal FY 2006 with the purpose of achieving a significant reduction in traffic fatalities and serious injuries on all public roads. (References: SAFETEA – LU Sections: 1101(a) (6) and 1401 and 23 USC Sections: 148 and 130).

This policy outlines Departmental roles, responsibilities and activities necessary to implement the HSIP to meet the requirements and intent of the legislation.

OVERVIEW

Illinois' HSIP is intended to be consistent with Federal Highway Administration's (FHWA) safety requirements. Those requirements are to produce a measurable and significant reduction in fatalities and serious injuries resulting from crashes on the highway system. The highway system includes all roadways under the jurisdiction of the Illinois Department of Transportation (IDOT) as well as those owned and maintained by local units of government. It includes at-grade highway-railway crossings.

SAFETEA-LU requires each State to develop and implement a State Strategic Highway Safety Plan (SHSP) in order to obligate funds for 23 USC 148 eligible activities. This SHSP is a statewide, coordinated, integrated safety plan that provides a comprehensive framework (4E's: Engineering, Enforcement, Education, and Emergency Medical Services) for reducing highway fatalities and serious injuries and establishes statewide goals, objectives, and key emphasis areas. Illinois has developed a Comprehensive Highway Safety Plan (ICHSP) (http://www.dot.il.gov/illinoisCHSP/default.html) and has set a goal to reduce traffic-related deaths to 1,000 or fewer by 2008. The ICHSP describes specific areas of emphasis based on a statewide evaluation of highway safety problems and also outlines successful past strategies and proposed new strategies considered appropriate for Illinois to address these problems. The ICHSP will be re-evaluated and updated on a regular basis to reflect advances in knowledge, progress toward accomplishing individual emphasis area objectives, and to address emerging safety concerns within Illinois. The ICHSP should therefore be used as a guide in the development of each District's and Local agency's safety program and the overall state safety program.

SAFETEA-LU requires annual evaluation reporting to the USDOT, Secretary of Transportation through the FHWA Division Office. The purpose of this reporting is to demonstrate the effectiveness of the Illinois HSIP in meeting the federal requirements – the reduction in fatalities and serious injuries. SAFETEA-LU also requires regular reporting identifying the top 5 percent of locations exhibiting the most severe safety needs based on crashes, injuries, deaths, traffic volume levels, and other relevant data as determined by Illinois, as well as an assessment of potential remedies, estimated costs associated with those remedies, and impediments to implementation other than cost with respect to these locations. Furthermore, FHWA intends to make Illinois' report available to the public through the U.S. DOT website. For these reasons, funds designated for use under the HSIP are intended solely for the use of addressing known safety problems contributing to fatalities and severe injuries (severe crashes).

It is recognized that many projects or portions of projects and many actions taken by the Department have a safety focus. Most highway projects incorporate one or more design features or elements that relate to highway safety. Examples include incorporation of guardrail in a design, intersection channelization, signing and pavement markings or other similar elements. Many projects involve reconstruction of a highway or portion thereof to current design standards. While one rationale for such projects or improvements is a general acknowledgement or enhancement of safety, such improvements are to be funded by other programs and not the HSIP. Appropriate use of HSIP funds is only for locations or corridors where a known, 'substantive safety' problem exists as indicated by location-specific data on fatalities and serious injuries, and where it is determined that the specific project action can with confidence produce a measurable and significant reduction in such fatalities or serious injuries. To achieve the maximum benefit, the focus of the program is on cost effective use of the funds allocated for safety improvements. Priority will be given to projects having higher total number of fatalities and serious injuries affected.

ALLOCATION OF FEDERAL HSIP FUNDS

Appendix A illustrates the funding allocation process for the Federal HSIP program. Federal HSIP funds are to be apportioned to the State of Illinois with two programs having set-aside funding. The first set-aside of the HSIP funding is the Highway - Railway Crossing fund. This fund is distributed into components for the State and Local programs. The second set-aside is the High Risk Rural Roads (HRRR) program targeted to rural collector and local roads. HSIP funds remaining after the set-asides will be distributed between State and Local roads for highway safety improvements.

HIGHWAY - RAILWAY CROSSING FUND

This program is a set-aside of the federal HSIP funds to reduce the number of fatalities and serious injuries at public highway-railway crossings through the elimination of hazards and/or the installation/upgrade of protective devices at crossings.

Illinois is required to conduct and systematically maintain an inventory of all highway- railway crossings that may require separation, relocation, or protective devices, and to establish and implement a schedule of projects for this purpose. At a minimum, this schedule is to provide signs for all highway-railway crossings. (Reference: 23USC130 (b)-(c))

It is required that at least 50 percent of the HSIP – Highway -Railway Crossing funds apportioned be used for the installation of protective devices at highway-railway grade crossings. In addition, up to 2 percent of the funds apportioned may be used for compilation and analysis of data for the required annual report to the U. S. Secretary of Transportation on the progress being made to implement the HSIP – Rail Program. Also, a railroad participating in an HSIP - Rail project is responsible for compensating the department for the net benefit to the railroad of the project. The net benefit to the railroad is determined by the U.S. Secretary of Transportation and may not exceed 10 percent of the project cost.

The department has decided to allocate 40 percent of the HSIP –Highway-Railway Crossing funds to projects on the State system and 60 percent to projects on the Local system. This allocation is subject to change based on system needs. The Federal share for this program is 90 percent. (References: SAFETEA-LU Section 1401 and 23 USC Section 130). IDOT's Bureau of Local Roads and Streets (BLRS) in conjunction with the Bureau of Safety Engineering (BSE) will administer the local HSIP-Rail program funds. IDOT's Bureau of Design and Environment (BDE) in conjunction with the Districts and the BSE will administer the state HSIP-Rail program funds.

HIGH-RISK RURAL ROADS PROGRAM (HRRR)

This program is a set-aside of federal HSIP funds intended for construction and operational safety improvements on high risk rural roads. High risk rural roads are defined as roadways functionally classified as rural major or minor collectors or rural local roads with a fatal or serious/A-injury crash rate above the statewide average for those functional classes of roadways; or likely to experience an increase in traffic volume that leads to a crash rate in excess of the statewide average rate. The Department allocates 100 percent of the funds set aside for this program to the HSIP - Local Road Program. The BLRS in conjunction with the BSE will administer these program funds. (References: SAFETEA – LU Section 1401 and 23 USC Section 148)

HSIP – ROAD

The Department has determined that the total HSIP – Road apportionment to Illinois will be split 80 percent to the HSIP – State Road Program and 20 percent to the HSIP – Local Road Program.

Road funds for the HSIP – State Road Program will have a portion allocated as statewide line items for project-related engineering, construction and operational safety improvements to be administered by the BSE. The remaining State funds will be allocated to each district using a 5-year average of fatal crashes on the State system as the basis for proportioning.

The Local Road Program component of HSIP – Road funds is a combination of the HRRR set-aside and Local HSIP funds. These funds will be administered by the BLRS in conjunction with the BSE.

DATA MANAGEMENT

Implementation of Illinois' CHSP and HSIP requires the assembly, review and use of data describing the safety performance of the highway system in the state. On the approximately 113,000 miles of roadway in Illinois, over 450,000 crashes resulting in about 1,450 fatalities occur annually. Data from various sources have to be complied and linked to identify high severity crash locations or corridors of interest in order to develop projects that will be addressed by the HSIP. Five years of historic crash data should be used to identify crash patterns and safety project locations.

IDOT's Division of Traffic Safety (DTS) collects, maintains and distributes crash data that is compiled from crash reports on a continuous basis. The crash data is housed within two data systems: General Accident Information (GAI) for years 1999 to 2003 and Crash Information System (CIS) for 2004 to present. Historically, the safety program was generated through locations identified by the High Accident Location Identification System (HALIS). The HALIS system was designed to take data from GAI and is not supported by CIS; therefore is obsolete. The last years supported for identification of High Accident Locations (HAL's) and Wet Pavement Cluster/Segments are 2001-2003. These lists are outdated and do not meet new program objectives and shall not be used to support future HSIP project identification and selection.

IDOT's Office of Planning and Programming (OPP) maintains the Illinois Roadway Inventory System (IRIS) database, which provides detailed roadway information on all roadway segments, spot locations, and highway-railway crossings. The crash database in conjunction with the IRIS data is the underlying information used to identify projects for the HSIP. GAI, CIS, and IRIS are pulled together through a Safety Data Mart to provide users preformatted reports and the ability to perform ad-hoc reporting.

IDOT's BLRS and BDE maintain an inventory of Local highway-railway crossings and State-maintained railroad crossings, respectively, that will be used to identify high risk highway-railway crossing locations.

Developing an effective statewide program will be a collaborative and integrated effort. The BSE is responsible for developing, implementing, and maintaining the ICHSP, guiding the efforts of the ICHSP into the HSIP. Both at the State and Local level, the engineering communities are encouraged to work with their law enforcement partners to identify locations and contributing factors of severe crashes.

In lieu of the HAL and Wet Pavement Cluster sites, the BSE has used data from the DTS to develop two new products. The first is a Geographic Information System (GIS) map of the top 5% public roadways with the most severe safety needs in the state. For this year, this 5% Severe Location map represents locations on the state system only.

This map has been forwarded to the Safety Committee in each district. It is expected to serve a similar purpose as the HAL locations had in the past. These locations will be posted on the USDOT public website. Another new resource developed by BSE is the GIS mapping of fatal and severe injury (A-injury) crashes in each district on the State system. This mapping is based on five years of crash data, sorted by crash type, and overlaid with the department's multi-year program. It has also been provided to the Safety Committee in each district. The intent of this mapping is to enable programmers, planners, and designers to visually review severe crash patterns and filter the data for crash or location parameters. This resource should be useful in starting to analyze the 5% severe locations, and to look for patterns or occurrences at other locations that provide opportunities for safety improvement. Both of these new products focus on fatal and severe injury crashes. This is according to the provisions of the HSIP from the Federal SAFETEA-LU highway reauthorization, and the ICHSP.

Efforts are underway to provide crash location data for historic local system crashes. BSE will assist the BLRS and local agencies in this effort. Completing this effort will allow local agencies to access five years of crash data through the Safety Data Mart. Until this data becomes available, local agencies should work with their local law enforcement to obtain and compile crash information, identify systematic problems or locations of severe crashes, determine contributing factors to the severe crash locations or system, and identify integrated strategies to address fatal and severe injury crashes that occur on the local roadway system.

BSE is also responsible for compiling the HSIP for Illinois based on input from Districts and local governments.

PROGRAM PLANNING AND SELECTION OF HSIP CANDIDATE PROJECTS

In order to achieve the requirements set forth by SAFETEA-LU and the ICHSP, opportunities to produce a measurable and significant reduction in fatalities and serious injuries resulting from crashes on the highway system need to be incorporated into the program planning process. The 5% Severe Location maps and the Fatal and Serious Injury maps will assist in this effort.

BSE will assist the Districts in identifying problem areas, and developing cost-effective strategies to implement at problem area locations. Such assistance will include development and distribution of the 5% Location maps and the Fatal and Serious/A- Injury maps. BSE will also provide lists and summaries of effective engineering countermeasures and methods for evaluating the cost-effectiveness of countermeasures. In addition, BSE will also provide consultation to assist in interpretation of data and information in the District's efforts. Districts are responsible for development of their recommended projects eligible for HSIP funding according to these guidelines. BSE will also identify system-wide safety improvements for certain ICHSP emphasis areas to be implemented by Districts for State highways.

The HSIP will be assembled from a planning process conducted by each of the Districts and local units of government. Each District shall establish and maintain a District Safety Committee comprising the following District positions or equivalent persons: Programming Engineer, Studies and Plans Engineer, Geometrics Engineer, Operations Design Engineer, and Traffic Engineer. The District Safety Committee is encouraged to coordinate with the law enforcement community (state and local) on a regular basis to identify severe crash locations, behavioral and engineering related contributing factors, and opportunities to provide integrated solutions to address the severe crash location.

Selected candidate projects shall be data driven and developed from:

- Materials (maps, data, screening lists) provided by BSE and/or the DTS,
- District documentation of existing high severity crash conditions, and Corridor/system wide crash trends.

Projects to be considered for funding under the Local Road Program component of HSIP – Road funds will be submitted through a solicitation of candidate projects by the BLRS and the BSE. Local agencies applying for HRRR funds under the HSIP shall provide documentation that the project location has an annual fatal crash rate or serious/A-injury rate that exceeds the values listed in the following table.

Functional Class	State Average Fatal Crashes per Year* (Fatal Crashes per 100 Centerline Miles)	State Average Serious/A-Injury Crashes per Year* (A-Injury Crashes per 100 Centerline Miles)
Rural Collector	2.7	4.4
Rural Local Road	0.5	6.2

*BASED ON A MINIMUM OF 5 MOST RECENT YEARS OF CRASH DATA; MINIMUM SEGMENT LENGTH OF 0.1 MILES.

The minimum length of a segment for calculating crash rates is 0.1 mile. For an intersection project, for the purposes of calculating segment lengths for comparison with threshold values above, a candidate intersection project should be assigned a segment length of 0.1 mile.

Spot locations with multiple fatalities or serious injuries will have a rate that significantly exceeds the statewide average rate for the respective functional class. To optimize the use of the HRRR funds, the threshold for project consideration will be a minimum of 1.0 fatal or 2 serious/A-injury crashes within the project limits.

Appendix B describes the project selection process to be used by both Districts and local governments. Each district and local agency submitting projects for HSIP funding, will establish priorities for HSIP project selection based on optimizing the reduction in fatal and serious injury crashes and the potential to reduce crash severity and/or frequency of severe crashes. The Central Safety Committee comprised of representatives from BSE, BDE, BLRS, and FHWA will review and approve submitted HSIP projects.

The keys to success in HSIP project selection will be 1) employing a data-driven project selection process that focuses on traffic fatalities and serious injuries; 2) studying the site and crash records for problem identification and contributing factors; 3) applying a full range of countermeasures proven effective in reducing crashes and tailored to specific highway types or conditions, and 4) focusing on lower cost solutions that will enable more sites and/or mileage that can be treated with the available funds. Highway safety improvement projects may include (but are not necessarily limited to one or more of the following:

- Improvement of highway signage and pavement markings
- Elimination of roadside obstacles
- Installation of guardrails, barriers, and crash attenuators
- Pavement and shoulder widening to remedy an unsafe condition

- Installation of rumble strips or other warning devices
- Realignment or reconstruction, lane additions
- Intersection safety improvements
- Installation of a skid-resistant surface (de-slick) at locations with a high frequency of severe crashes related to friction deficiency
- Improvement for pedestrian or bicyclist safety
- Construction of traffic calming features
- Improvement of crash data systems
- Installation of a traffic control or other warning device at a severe crash location

Appendix C contains a list of relevant technical literature providing background on appropriate engineering improvement countermeasures.

Districts should use data and information provided by the BSE and DTS to initiate project selection. Districts are encouraged to supplement these data with more recent crash data, GIS technology capabilities, and other severe crash information not provided by BSE or the Division of Traffic Safety. Districts shall maintain a focus on addressing fatal and serious injury crashes in the use of supplementary data or information.

Systematic improvements demarcated as a Low Cost Safety Improvement (LCSI) in the Guidelines to Counter Measure Effectiveness and Crash Reduction Factors (Appendix E) may be proposed.

Districts will analyze candidate HSIP projects to determine the appropriateness of an engineering solution. Site-specific knowledge of conditions and engineering feasibility are critical elements of this analysis. Fatalities and serious injuries are infrequent compared to all other crashes; therefore five years of crash data should be used for the analysis in order to better understand the crash trends and assure that selected sites are truly high risk locations.

Several additional tools are available for district analyses and engineering studies including, but not limited to, field visits, crash report evaluations, road safety analyses, police narrative analyses, crash reconstruction reports, CRS video logs, and Road Safety Assessments (RSA).

Local governments should use a process similar to that used by the Districts. Information (maps, data, etc.) will be made available by the BSE for use by local governments, which will be responsible for supplementing the information with their own data or field studies to provide the necessary knowledge base to perform all needed studies. The Safety Data Mart is planned to be accessible to local agencies.

BSE compiles the overall state program and reports to FHWA on overall program costs and effectiveness.

DOCUMENTATION AND REPORTING

The primary method for determining cost-effective site selection and treatment will be a benefit-to-cost estimation procedure. Applications for funding under the HSIP program must include a complete benefit-to-cost calculation according to the methodology described by BSE (Appendix D). This methodology includes recording of site-specific crash information, fatality and injury data, application of countermeasure effectiveness (Appendix E), and countermeasure service life (Appendix F).

All candidate project submittals and the appropriate documentation should be on the attached HSIP Candidate form (Appendix G). The Department has performed several RSAs for state and local projects. Training has been provided in three districts, and further training is planned as part of the Program Development Technical Training Program. RSA's will become the preferred tool for analysis of HSIP project locations, and should be considered suitable for any project. It is recommended that an RSA be completed for each site, segment, or systematic improvement proposed. The RSA shall include identification and rating of risks within the project limits and justification for each that will or will not be addressed by the proposed work. Documentation of crashes, existing conditions contributing to the crashes and relation of the proposed countermeasures to the identified crash risks will be critical to the approval of all projects. A sample submittal package is attached in Appendix H. RSAs will be required for HSIP projects on the State highway system entering into the FY09 program.

IMPLEMENTATION

Prioritized State HSIP project candidates shall be submitted to the State Safety Engineer, BSE, by February 28.

Prioritized Local HSIP project candidates shall be submitted to the BLRS which, upon review and approval for completeness per this policy, will submit them to the State Safety Engineer, BSE, by March 15. The BLRS will input data for listing of local HSIP projects.

Prioritized HSIP – Rail project candidates for the state system shall be submitted to the State Safety Engineer, BSE, by March 30. Prioritized project candidates for the Local system shall be submitted to the BLRS which, upon acceptable review, will submit them to the State Safety Engineer, BSE, by April 1.

Prioritized HRRR project candidates shall be submitted to the BLRS which, upon acceptable review, will submit them to the State Safety Engineer, BSE, by March 15. The BLRS will input data for listing of HRRR projects.

The BSE will compile a list of all projects submitted under the HSIP. A Central HSIP Committee, chaired by the State Safety Engineer, BSE, with members from the BSE Safety Implementation Section, FHWA Mobility and Safety Team, the appropriate field engineers from the BDE and FHWA, and BLRS (for local roads projects) will review and approve or disapprove all HSIP, HSIP – Rail, and HRRR projects submitted under the HSIP.

To meet the requirements set forth by the ICHSP and SAFETEA-LU, HSIP funds need to be directed to locations and improvements that can achieve the greatest impact towards reducing severe crashes. It is anticipated that applications from Districts and local agencies with supporting Benefit-to-Cost (B/C) calculations will exceed available funds. Approval of projects and their inclusion in the Illinois HSIP will be on the basis of those projects with the highest B/C ratio. Only projects having a B/C ratio great than one may be selected, but not all projects with a B/C ratio of greater than one will be selected. Projects that are disapproved will be returned to the submitting agency with an explanation for their exclusion from the program. This may entail lack of sufficient information, or a note that other projects considered more worthy (per their B/C determination) required use of the fiscal year's HSIP allocation. Projects disapproved in one fiscal year may be re-submitted in subsequent years, but with the understanding that data and analyses should be updated.

Approved projects will be forwarded to OPP to be included in the annual program. OPP will code approved projects so they are identifiable as an HSIP projects.

PROGRAM EVALUATION

HSIP project evaluation will be performed according to the requirements outlined in the Code of Federal Regulations, Title 23, Volume 1, Section 924.13. The BSE will coordinate with each District Safety Committee to track project locations, safety improvements performed, and level of effectiveness of the improvement with respect to reducing fatalities and severe injuries.

REPORTING TO FHWA

A report covering the HSIP during the previous July 1 through June 30 period shall be submitted to the Illinois FHWA Division Administrator no later than August 31 each year. It shall report on the progress made in implementing the HSIP – Road program and the HSIP – Rail program, and shall evaluate the effectiveness of completed highway safety improvement projects in these programs. This report shall describe the extent to which the improvements funded under this program contribute to the goals of reducing the number of roadway-related injuries and fatalities and the occurrences of roadway-related crashes, mitigating the consequences of roadway-related crashes, and reducing the occurrences of crashes at highway-railway crossings. This information shall be made available to the public through the department's website. The BSE will coordinate with each District Safety Committee, BLRS, and BDE and prepare the annual report.

APPENDIX

A. Allocation of Federal HSIP Funds Flow Chart
B. Project Selection Process
C. Peer Groups & References on Counter Measures
D. Benefit-to-Cost Methodology
E. Guidelines to Counter Measure Effectiveness & Crash Reduction Factor
F. Guidelines to Counter Measure Service Life
G. HSIP Candidate Form
H. Example of Submittal Package

State Safety Engineer ______________________
Priscilla A. Tobias

Highway Safety Improvement Program

Benefit-Cost Tool

Users Guide

Illinois Department of Transportation

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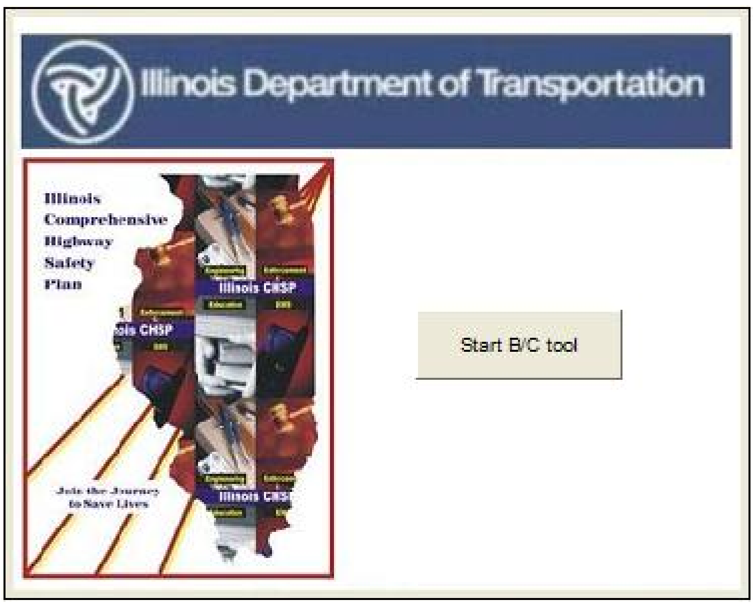
Contents

1.0 Introduction

Benefit-cost analysis (BCA) is one of the tools used to determine if a project is appropriate for receipt of Highway Safety Improvement (HSIP) funding support. An approved project should have a safety focus and result in an improvement which will likely reduce the number of fatal and/or severe injury crashes. To facilitate the process, the Illinois Department of Transportation developed a BCA tool to aid in quick and accurate evaluation of highway improvement proposals.

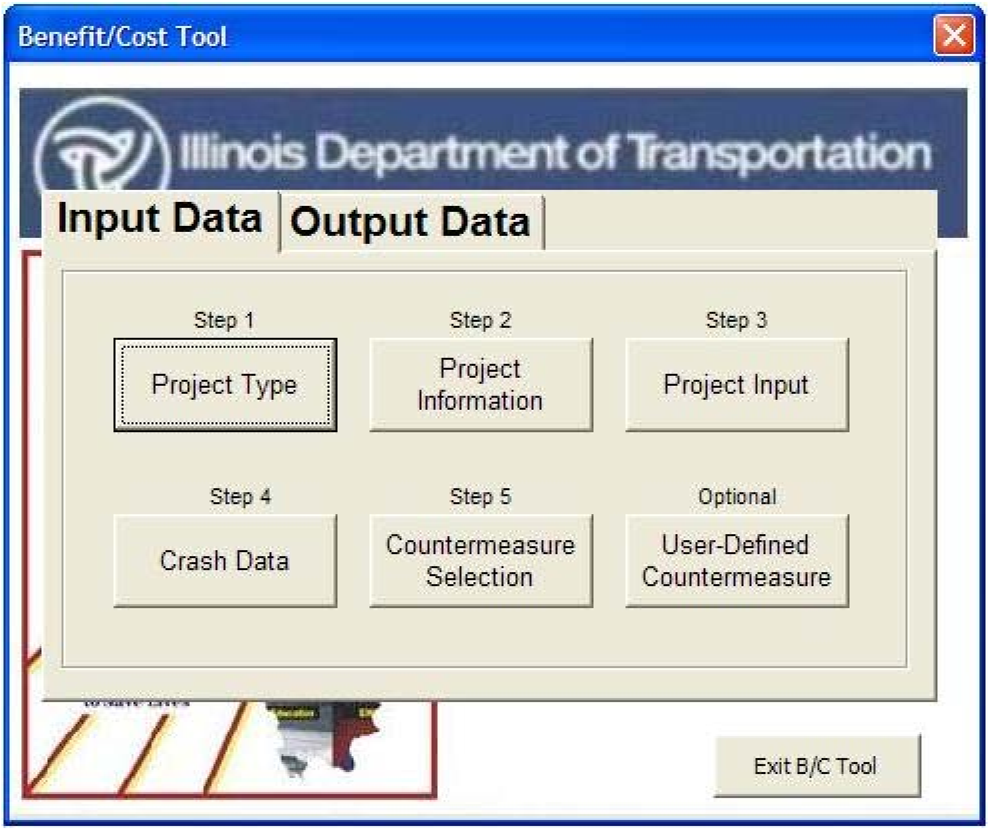
This guide provides step-by-step instructions for using the BCA tool developed by IDOT. It also provides several example scenarios to assist the user in understanding use of the tool in project development. The final section of this document provides guidelines for appropriate benefit-cost values.

2.0 Step-by-Step Instructions



The image above shows the opening page of the B/C tool.

STEP 1: Start by pressing the **Start B/C Tool** button.

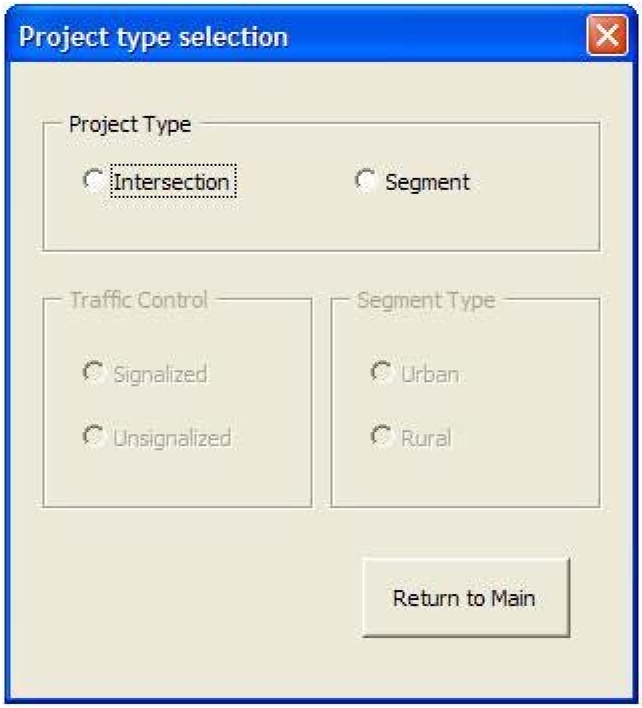


The main menu will open after selecting start. The main menu has two tabs located at the top of the screen. One is for entering Input Data and the other for obtaining Output Data.

STEP 2: Select the **Input Data** tab if necessary. This is the default and should have been open when starting the tool.

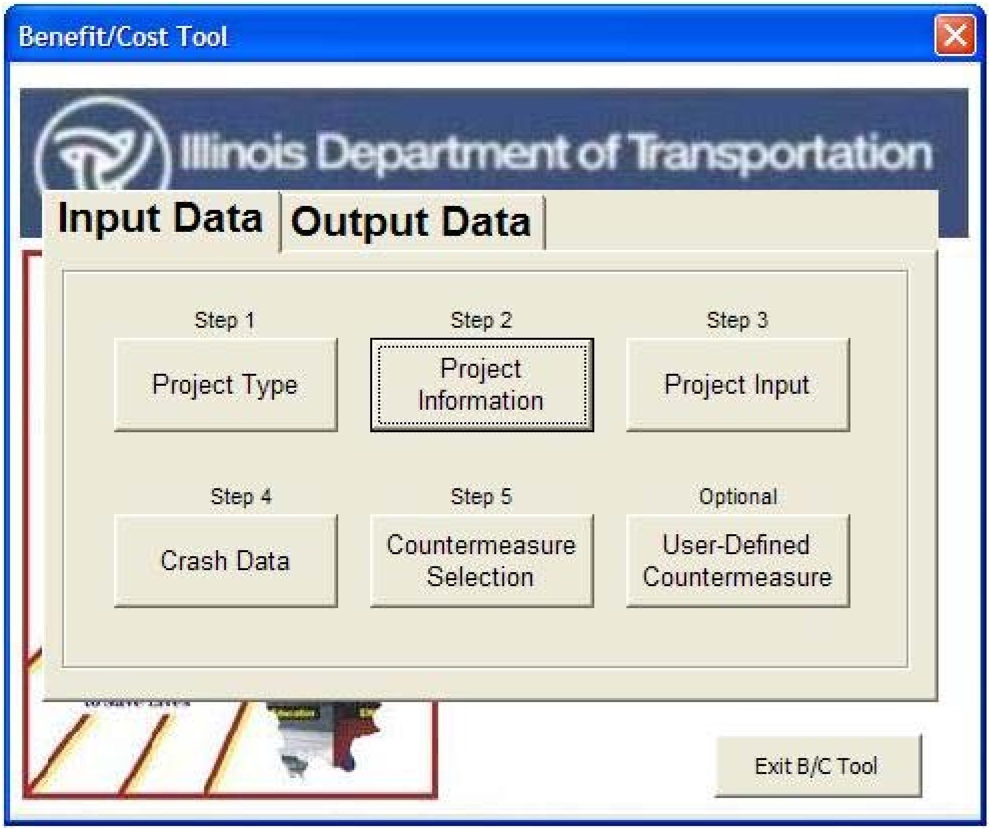
The input tab shows a series of steps. It is recommended that you follow the sequence of input steps as shown in the pop-up window; however you can come back to buttons to revise the data as needed.

STEP 3: Select the button labeled **Project Type**



The Project Type Selection window will appear.

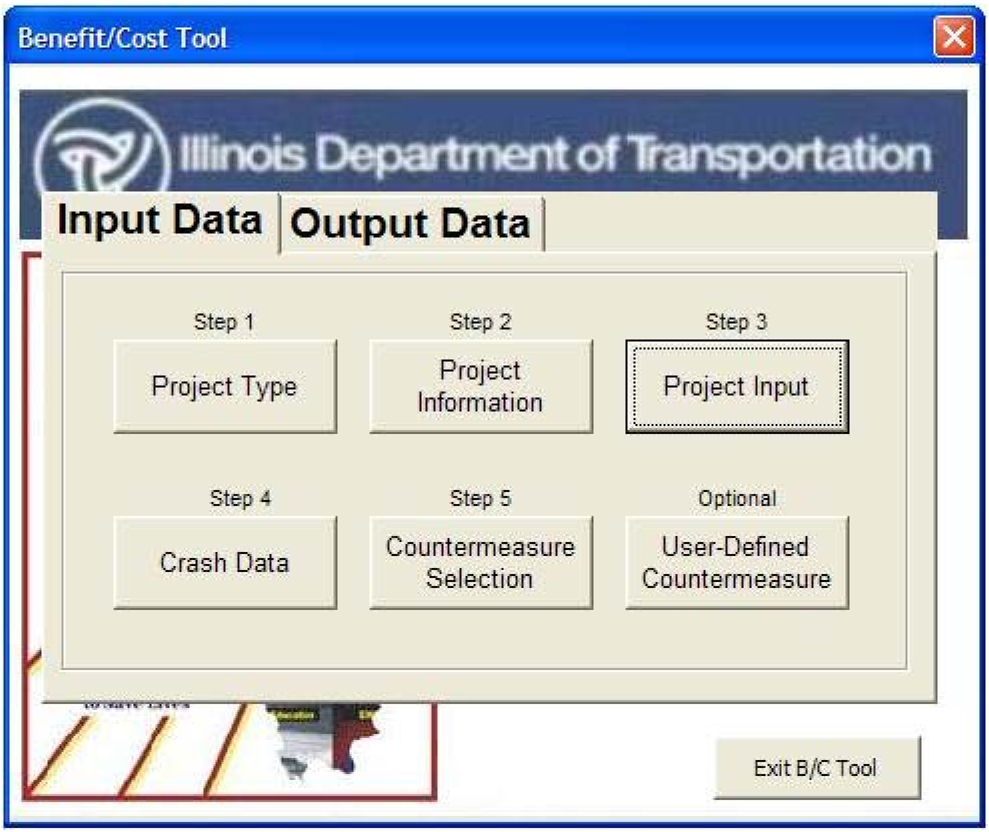
STEP 4: Select project type by clicking on the circle next to **Intersection** or **Segment** depending on the type of project you are analyzing. If **Intersection** is selected you will be given the option of **Signalized** or **Unsignalized**. If **Segment** is selected you will be given the option of **Urban** or **Rural**. Make the selection by clicking on the circle next to the appropriate category. When complete click on the **Return to Main** button to return to the main input window.



STEP 5: On the main menu, select the button labeled **Project Information**.

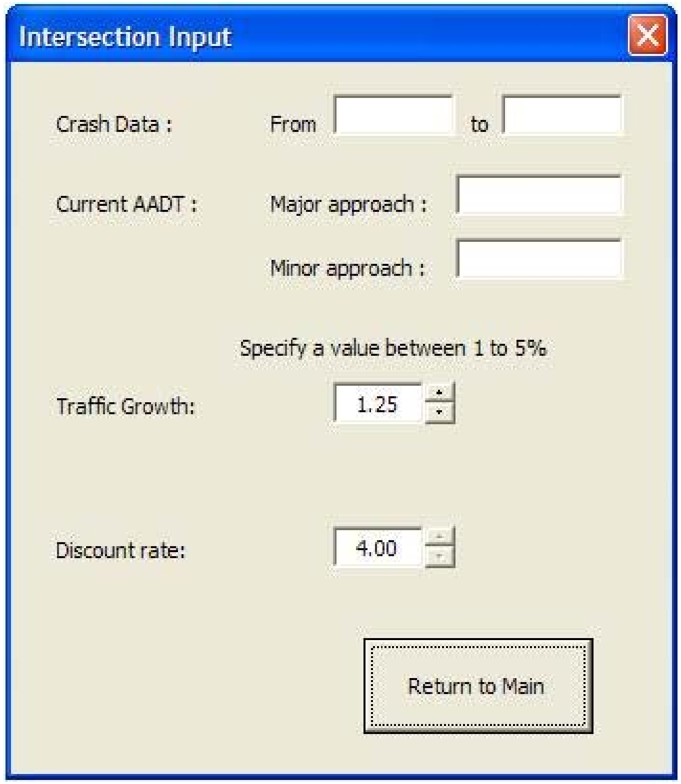
The Project Information window will open as shown above.

STEP 6: Complete the information in the boxes shown. For segments enter either key route or marked route and the beginning milepost station. Key Route refers to the Illinois Roadway Information System (IRIS) terminology and it is a universal identifier for any segment. Marked Route refers to the Division of Traffic Safety route inventory. The key route information is not necessary for intersections, but all information provided will assist in tracking projects. For the **Location** field enter a description like "Maple Road and Oak Street" for an intersection or "Maple Road between Oak Street and Walnut Street" for a segment. When all fields have been completed, click on **Return to Main**.

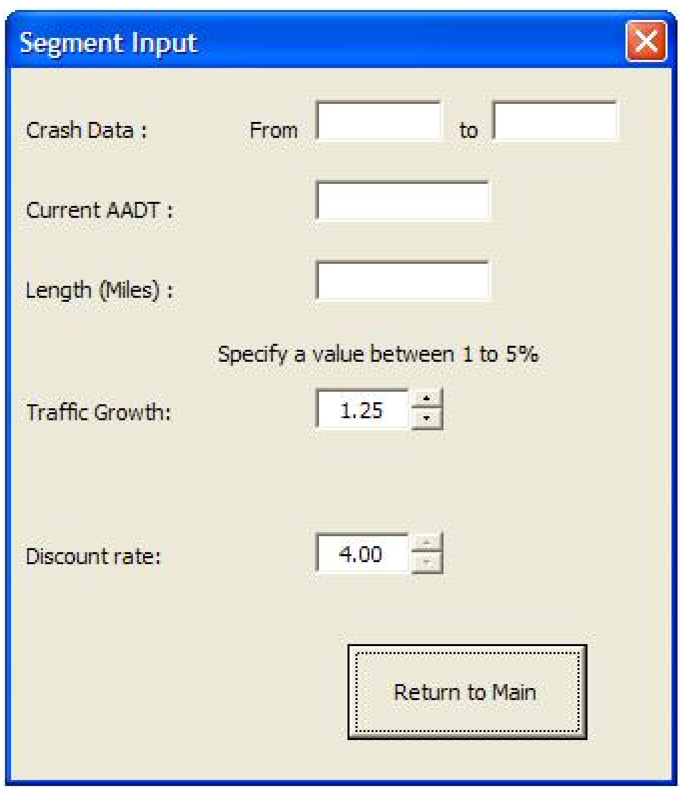


The main menu will re-open.

STEP 7: Select the button labeled **Project Input**.

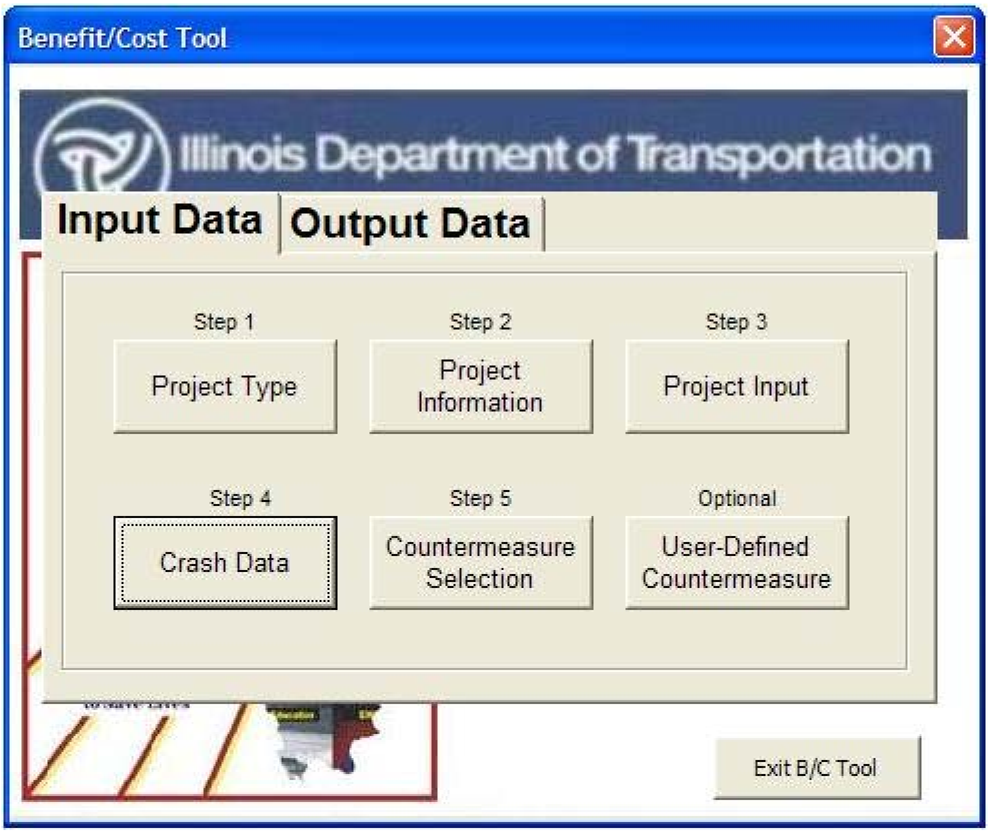


If intersection project type was selected, the project input window shown above will appear.



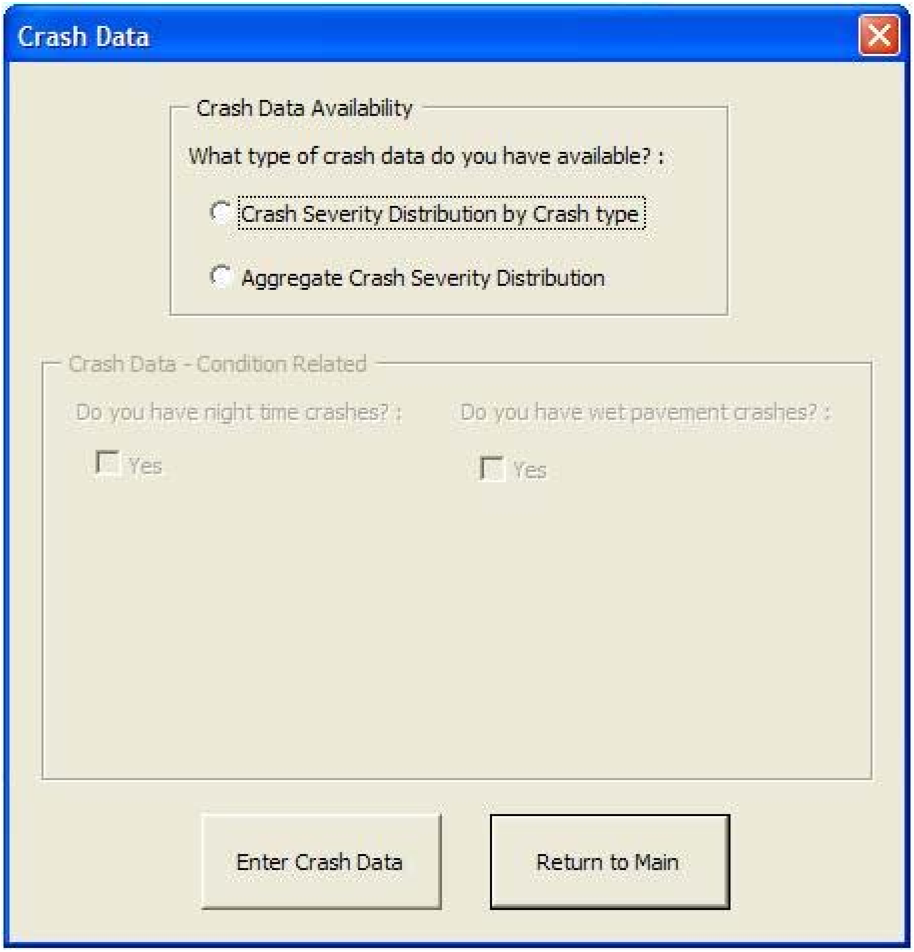
If segment project type was selected, the above project input window will appear.

STEP 8: Input the information requested in the fields of either the **Intersection Input** or **Segment Input** window. For **Crash Data,** enter the period for which crash data is available (for example, From 2001 to 2005). Enter the **Current AADT**(Average Annual Daily Traffic), length of project if applicable, and the annual traffic growth. The annual **traffic growth** should be a number between 1 and 5. If no selection is made, the default value of 1.25 will be shown. If the user enters a value less than one, it is assumed that the traffic growth is declining. The **discount rate** cannot be modified from the default value of 4.00. When complete with all fields click on **Return to Main**.



The main menu will re-open.

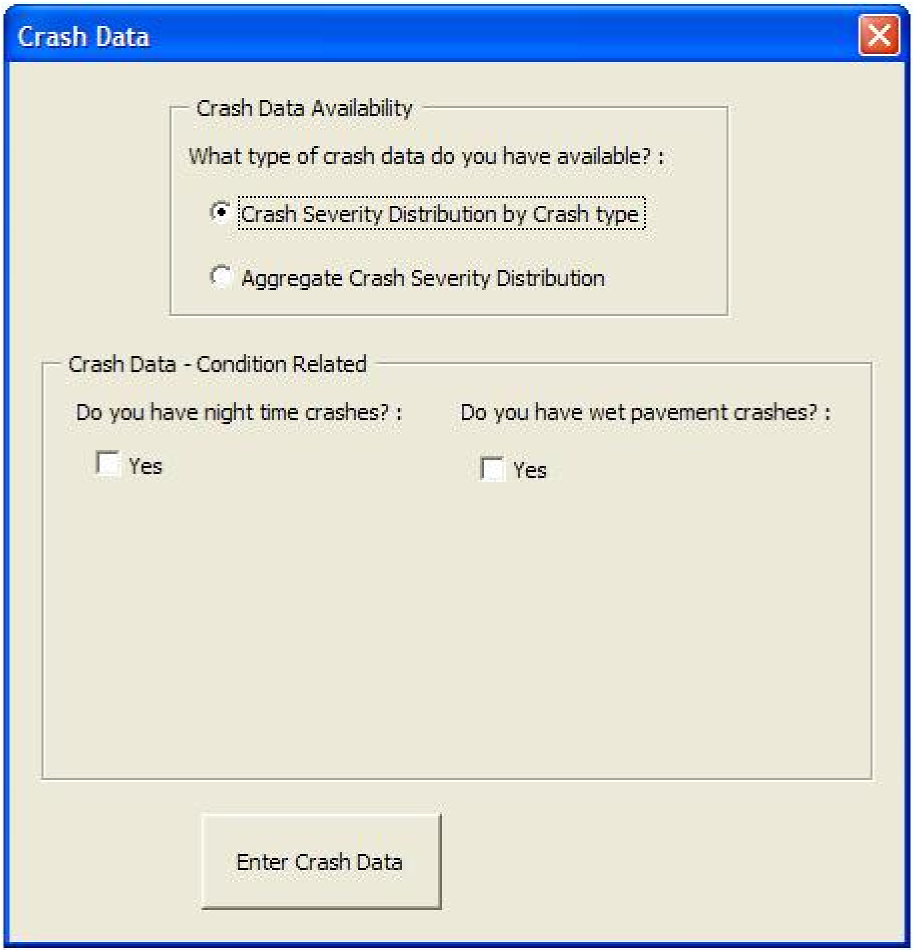
STEP 9: Select the button labeled **Crash Data**.



The above window will open.

STEP 10: If crash type and crash severity data are available, select **Crash Severity Distribution by Crash Type** by clicking on the circle next to the text. If crash type data are not available, select the **Aggregate Crash Severity Distribution** category by clicking on the circle next to the text. In most cases crash type data will be available. This is the preferred condition since countermeasures are applied to reduce particular crash types.

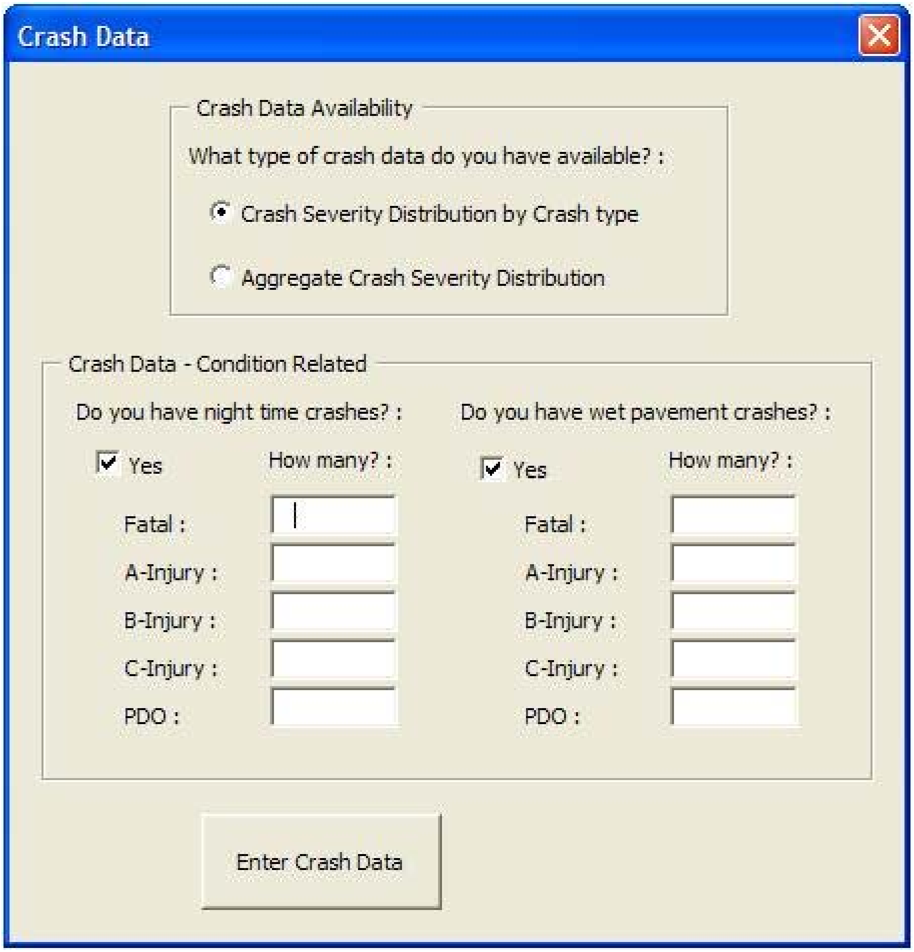
If **Crash Severity Distribution by Crash Type** is selected, follow STEPs 11A to 13A. If **Aggregate Crash Severity Distribution** is selected, skip to STEP 11B and follow to STEP 12B.



When **Crash Severity Distribution by Crash Type** is selected **Crash Data – Condition Related** will highlight as shown in the above window.

STEP 11A: If there are night time crashes in your data set, click on the **Yes** box following the question, **Do you have night time crashes?** If there are wet pavement crashes in your data set, click on the **Yes** box following the question, **Do you have wet pavement crashes?**

See page 27 to learn more about obtaining crash information from the crash reports.



If you have clicked "Yes" to questions regarding either night time or wet pavement crashes, boxes will become available to complete crash severity for the night or wet pavement crashes. These are shown in the window above.

STEP 12A: Enter the number of crashes by severity that have occurred at night or under wet pavement conditions during the analysis period. When complete, select the **Enter Crash Data** button.

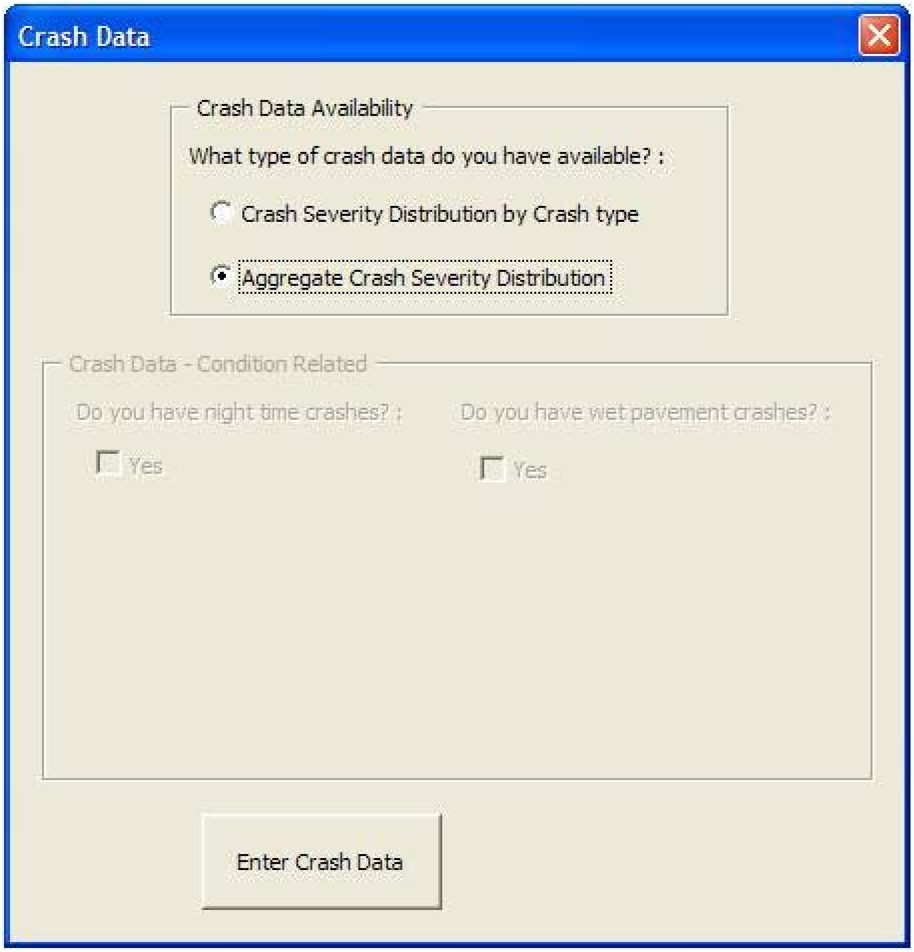
INTERSECTION CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD

	Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overturned	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train
	AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	RT	SSD	SOD	T	TR
Fatal Crashes																	
A-Injury Crashes																	
B-Injury Crashes																	
C-Injury Crashes																	
PDO Crashes																	

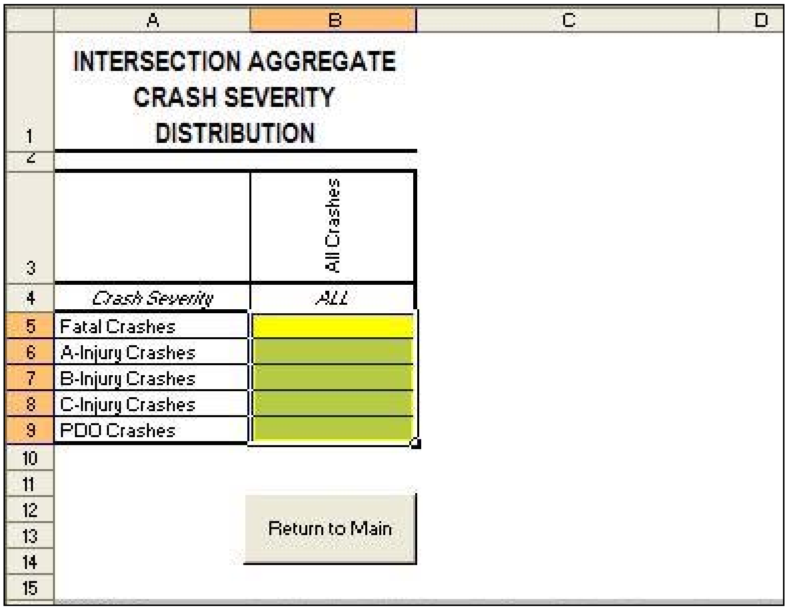
Return to Main

After selecting “Enter Crash Data,” the input box, “Intersection Crash Severity by Crash Type for Analysis Period” will appear.

STEP 13A: Enter the crash data for the analysis period by crash type and severity. Individual crashes should only be entered once based on the first event of the crash. When complete, select the **Return to Main** button and continue with STEP 14. Be sure to “enter” the last data entered by using the **Enter** key or clicking another cell before attempting to click the **Return to Main** button.

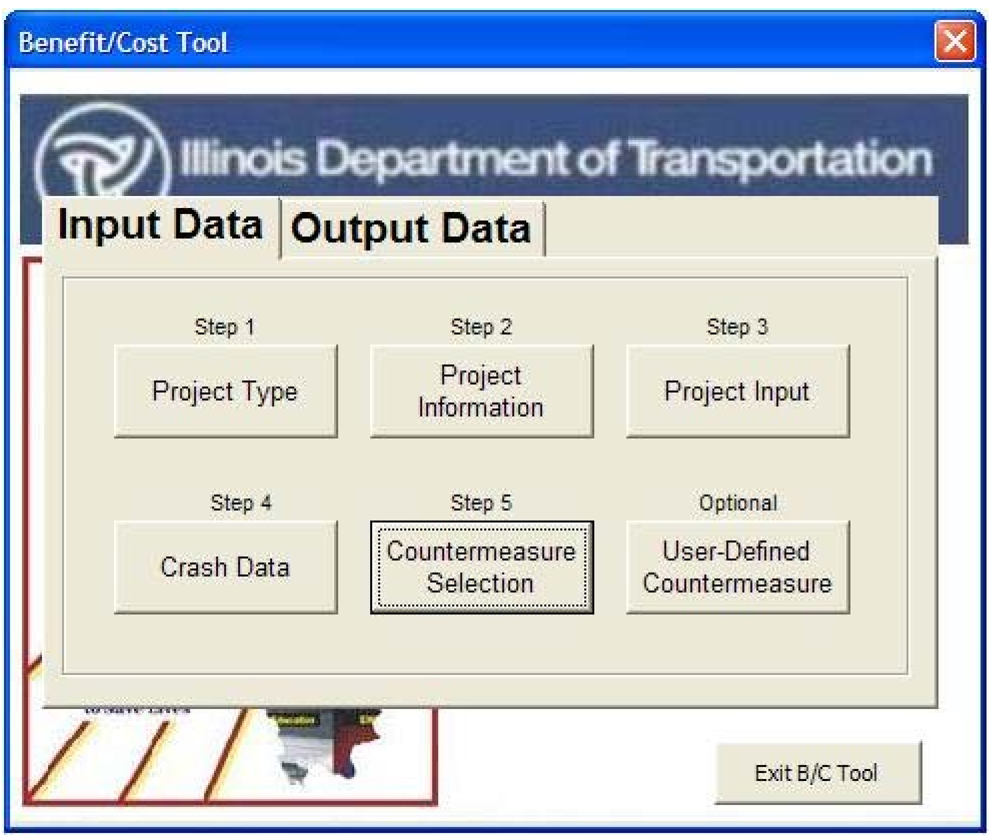


STEP 11B: If crash type by severity is not available, click on the circle next to **Aggregate Crash Severity Distribution** in the Crash Data screen. Then click on **Enter Crash Data** to enter aggregate crashes by severity. It is important to notice that the user will not be able to input night time or wet pavement crashes with an aggregate crash severity distribution. If **Aggregate Crash Severity Distribution** is selected, the **Crash Data – Condition Related** frame will not become available as is shown in the figure above.



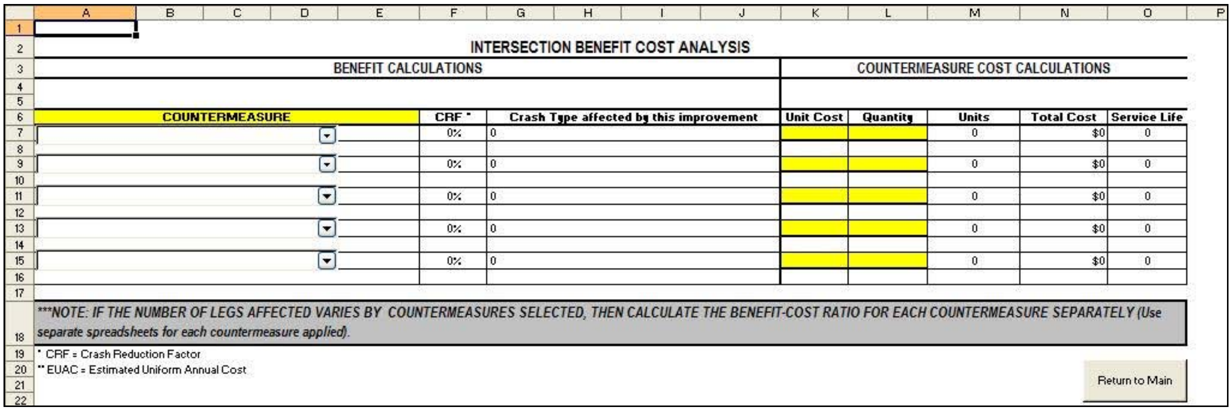
After selecting **Enter Crash Data** the input box shown above will appear. The box shown is for intersections, but a similar table will appear for segments.

STEP 12B: Enter the number of crashes by severity that have occurred during the analysis period. When complete, select the **Return to Main** button. Be sure to "enter" the last data entered by using the Enter key or clicking another cell before attempting to click the Return to Main button.



The main menu will re-open.

STEP 14: Select the button labeled **Countermeasure Selection**.



INTERSECTION BENEFIT COST ANALYSIS

BENEFIT CALCULATIONS			COUNTERMEASURE COST CALCULATIONS				
COUNTERMEASURE	CRF *	Crash Type affected by this improvement	Unit Cost	Quantity	Units	Total Cost	Service Life
	0%	0			0	$0	0
	0%	0			0	$0	0
	0%	0			0	$0	0
	0%	0			0	$0	0
	0%	0			0	$0	0

***NOTE: IF THE NUMBER OF LEGS AFFECTED VARIES BY COUNTERMEASURES SELECTED, THEN CALCULATE THE BENEFIT-COST RATIO FOR EACH COUNTERMEASURE SEPARATELY (Use separate spreadsheets for each countermeasure applied).

* CRF = Crash Reduction Factor
** EUAC = Estimated Uniform Annual Cost

Return to Main

If intersection project type was selected, the countermeasure table shown above will appear. If segment project type was selected, a similar countermeasure table will appear.

STEP 15: Review the list of countermeasures shown in Table 1 for intersections and Table 2 for segment. Select countermeasures that affect the predominant crash types in the data set for the intersection or segment to be analyzed. It is also recommended that you review the "Desktop Reference for Crash Reduction Factors" published by the USDOT and FHWA on September 2007 for additional countermeasures and current crash reduction factors (CRF). A CRF is a percentage of crash reduction that can be expected for implementing specific countermeasure. For example, if shoulder rumble strips are added to a facility there is an expected thirty percent reduction in the number of fixed object and overturn crashes.

TABLE 1: INTERSECTION COUNTERMEASURES

COUNTERMEASURES	Unit	Service Life	CRF	Crash Type Affected
1.1 General				
1.1.1 Improvement/Realignment/Reconstruction URBAN	Unit Qnty	15	50%	All
1.1.2 Improvement/Realignment/Reconstruction RURAL	Unit Qnty	15	30%	All
1.2 Pavement				
1.2.1 Widening and Resurfacing or Widening alone	Miles	15	25%	All
1.2.2 Resurfacing alone	Miles	10	-	
1.2.3 De-Slick (formerly known as skidproofing)	Miles	5	45%	WP
1.2.4 Rumble Strips (Shoulder)	Miles	3	30%	FO,OVT-off the road
1.2.5 Rumble Strips (Centerline)	Miles	3	-	
1.2.6 Rumble Strips (Transverse)	Miles	3	25%	All
1.2.7 Channelization	Miles	15	50%	RE,HO,SSD,SOD,LT,FO,OVT,T,RT
1.2.8 Raised Reflective Marker Median	Miles	15	50%	HO,SOD,LT,T,RT
1.2.9 Rumble Strip Median	Miles	10	50%	HO,SOD,LT,T,RT
1.2.10 Thermoplastic or Preformed Tape Median	Miles	3	50%	RE,HO,SSD,SOD,LT,RT,T
1.2.11 Painted Median	Miles	2	50%	RE,HO,SSD,SOD,LT,RT,T
1.2.12 Lane Addition	Unit Qnty	15	50%	RE,SSD, LT,RT,T
1.2.13 Left Turn Lane	Unit Qnty	15	25%	Each leg w/added Left turn, RE,SSD,SOD,LT
1.2.14 Right Turn Lane	Unit Qnty	15	25%	Each leg w/added Right turn, RE,SSD,RT
1.2.15 Bidirectional Left Turn Lane	Unit Qnty	15	50%	RE,HO,SSD,SOD,LT
1.2.16 Left Turn Acceleration Lane	Unit Qnty	15	50%	RE,SOD,SSD,AG,LT
1.2.17 Right Turn Acceleration Lane	Unit Qnty	15	50%	RE,SSD,RT
1.2.18 Deceleration Lane	Unit Qnty	15	50%	RE,SSD,RT
1.2.19 One-Way Couple	Unit Qnty	15	50%	All
1.2.20 Install Roundabout	Unit Qnty	15	60%	All
1.2.21 Install Passing Lane	Unit Qnty	15	25%	All
1.2.22 Increase Width of Paved Shoulder	Miles	10	10%	All
1.2.23 Increase Lane Width	Miles	15	10%	All

TABLE 1: INTERSECTION COUNTERMEASURES

COUNTERMEASURES	Unit	Service Life	CRF	Crash Type Affected
1.3 Signing				
1.3.1 Modernization	Unit Qnty	6	25%	All
1.3.2 Installation	Unit Qnty	6	40%	All
1.3.3 Speed Signing	Unit Qnty	6	40%	All
1.3.4 Advance Warning Signs	Unit Qnty	6	25%	All
1.3.5 Street Name Signs	Unit Qnty	6	25%	All
1.3.6 Four Way Stop	Unit Qnty	5	50%	All
1.3.7 Minor Leg Stop	Unit Qnty	5	40%	AG,LT,RT,T
1.3.8 Yield Sign	Unit Qnty	5	40%	AG,LT,RT,T
1.3.9 Changeable Message Signs	Unit Qnty	6	10%	All
1.3.10 Delineators	Unit Qnty	4	40%	All
1.3.11 Overhead Sign Truss	Unit Qnty	15	40%	RE,SOD
1.4 Signalization				
1.4.1 Modernization	Unit Qnty	10	25%	PD,FO,RE,SSD,SOD,AG,LT,RT,T
1.4.2 Install Traffic Signals	Unit Qnty	15	23%,-38%	23% All Other. -38% RE. 67% RAG
1.4.3 Relocation of Signal Supports	Unit Qnty	15	25%	FO
1.4.4 Advance Warning with Flasher	Unit Qnty	10	15%	OVT,FO,RE,SSD,SOD,AG,LT,RT,T
1.4.5 Red/Yellow Flashing Beacon	Unit Qnty	10	NR	Not recommended.
1.4.6 Red Flashing Beacon	Unit Qnty	10	45%	AG
1.4.7 Add Left Turn Phase with Left Turn Lane	Unit Qnty	10	35%	All
1.4.8 Add Left Turn Phase without Left Turn Lane	Unit Qnty	10	25%	All
1.4.9 Phase Adjustment	Unit Qnty	10	25%	All
1.4.10 Increase to 12 Inch Lens	Unit Qnty	10	25%	All
1.4.11 Add Traffic Actuation	Unit Qnty	10	25%	RE,AG,LT,RT,T
1.4.12 Time Lane Control	Unit Qnty	10	25%	HO,SOD
1.4.13 Optical Programmed	Unit Qnty	10	25%	RE,AG,LT,RT,T
1.4.14 Add Pedestrian Controls	Unit Qnty	10	25%	PD,PDC
1.4.15 Add Mast Arms and Signal Head per Lane	Unit Qnty	15	25%	RE,AG,LT,RT,T
1.4.16 Safety Lighting	Unit Qnty	15	50%	50% NGT

TABLE 1: INTERSECTION COUNTERMEASURES

COUNTERMEASURES	Unit	Service Life	CRF	Crash Type Affected
1.4.17 Install Automated Enforcement of Red Light Violations	Unit Qnty	10	25%	AG, -15% RE
1.4.18 User defined 01				
1.4.19 User defined 02				
1.4.20 User defined 03				

TABLE 2: SEGMENT COUNTERMEASURES

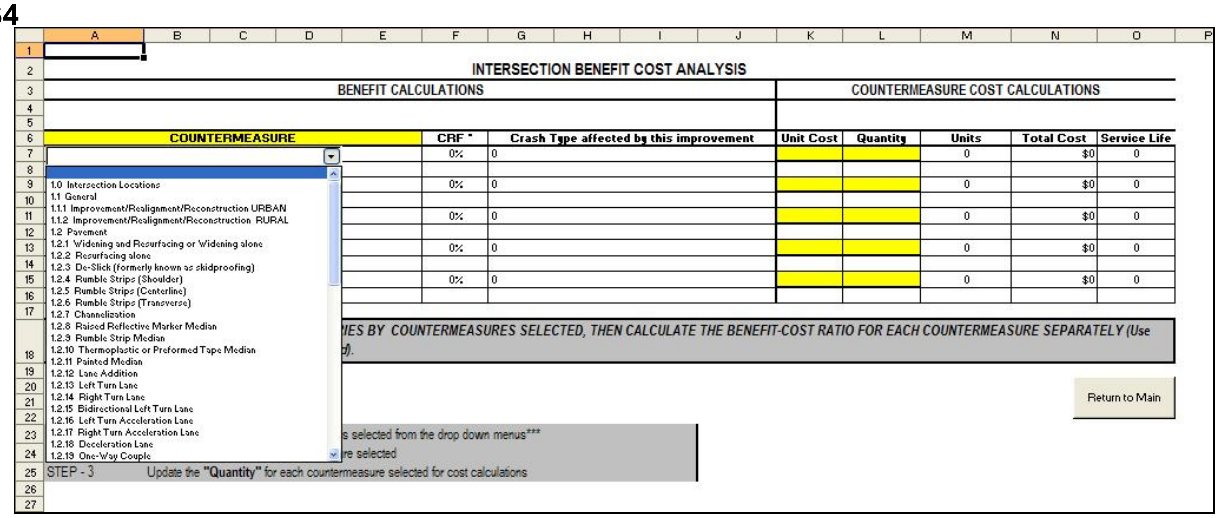
COUNTERMEASURES	Unit	Service Life	CRF	Crash Type Affected
2.1 Pavement Treatments				
2.1.1 Widening and Resurfacing or Widening alone	Miles	15	25%	All
2.1.2 Resurfacing alone	Miles	10	0%	No CRF identified
2.1.3 De-Slick (formerly known as skidproofing)	Miles	5	45%	WP
2.1.4 Rumble Strips (Shoulder)	Miles	3	30%	FO,OVT
2.1.5 Rumble Strips (Centerline)	Miles	3	20%	HO,SOD
2.2 Pavement Marking				
2.2.1 General Pavement Marking	Miles	1	30%	All
2.2.2 Raised Reflective Markers	Miles	4	30%	NGT on tangent sections. For curves, see table 1 of the HSIP Policy.
2.3 Railroad Crossing				
2.3.1 Modification	Miles	15	50%	TR,FO,RE,OVT
2.3.2 Gates	Miles	15	60%	TR,FO,RE,OVT
2.3.3 Crossbucks	Miles	15	60%	TR,FO,OVT
2.3.4 Flashing lights	Unit Qnty	15	60%	TR,FO,RE,OVT
2.3.5 Flashing Beacons	Unit Qnty	15	60%	TR,FO,RE,OVT
2.3.6 Warning Bells	Unit Qnty	15	50%	TR
2.3.7 Pavement Markings	Miles	2	30%	TR,RE,FO,OVT
2.3.8 Warning Signs - Standard	Unit Qnty	2	40%	TR,FO,RE,OVT

TABLE 2: SEGMENT COUNTERMEASURES

COUNTERMEASURES	Unit	Service Life	CRF	Crash Type Affected
2.1 Pavement Treatments				
2.1.1 Widening and Resurfacing or Widening alone	Miles	15	25%	All
2.3.9 Warning Signs - Special	Unit Qnty	5	40%	TR,FO,RE,OVT
2.3.10 Delineators	Miles	4	40%	TR,FO,OVT
2.3.11 Safety Lighting	Unit Qnty	15	50%	TR,FO,RE,OVT
2.3.12 Resurfacing	Miles	10	25%	TR,FO,RE,OVT
2.3.13 Grade Separation	Unit Qnty	20	100%	All
2.3.14 Removal (specify which type of removal)	Miles	20	50%	All
2.4 Bridge				
2.4.1 General Repair	Miles	10	15%	PKV, HO,SOD,SSD,FO,OVT
2.4.2 Widen/Resurface	Miles	15	15%	FO,HO,SOD,SSD,OVT
2.4.3 Widening	Miles	15	15%	FO,HO,SOD,SSD,OVT
2.4.4 De-Slick	Miles	5	45%	WP
2.4.5 Grooving	Miles	7	45%	WP
2.4.6 Frost/Ice Detectors - Sign	Unit Qnty	10	25%	FO,HO,SOD,SSD,OVT
2.4.7 Frost/Ice Detectors - Radio	Unit Qnty	10	25%	PKV, HO,SOD,SSD,FO,OVT
2.4.8 Guardrail	Miles	10	15%	FO,OVT
2.4.9 Separation between Pedestrians/Traffic	Miles	15	95%	PD,PDC,FO,OVT
2.4.10 Safety Lighting	Unit Qnty	15	50%	NGT
2.4.11 Delineators	Miles	4	15%	FO,OVT
2.4.12 Impact Attenuators	Unit Qnty	3	70%	FO,OVT
2.4.13 Reconstruction	Miles	20	50%	FO,HO,SOD,SSD,OVT
2.5 Curves				
2.5.1 Realignment/Reconstruction URBAN	Miles	15	35%	OVT,FO,HO,SSD,SOD
2.5.2 Superelevation	Miles	15		Variable, see table 2 in the HSIP Policy.
2.5.3 Daylighting	Miles	15	30%	OVT,FO,HO,SSD,SOD
2.5.4 Widening and Resurfacing or Widening alone	Miles	15	25%	All
2.5.5 De-Slick (formerly known as	Miles	5	45%	WP

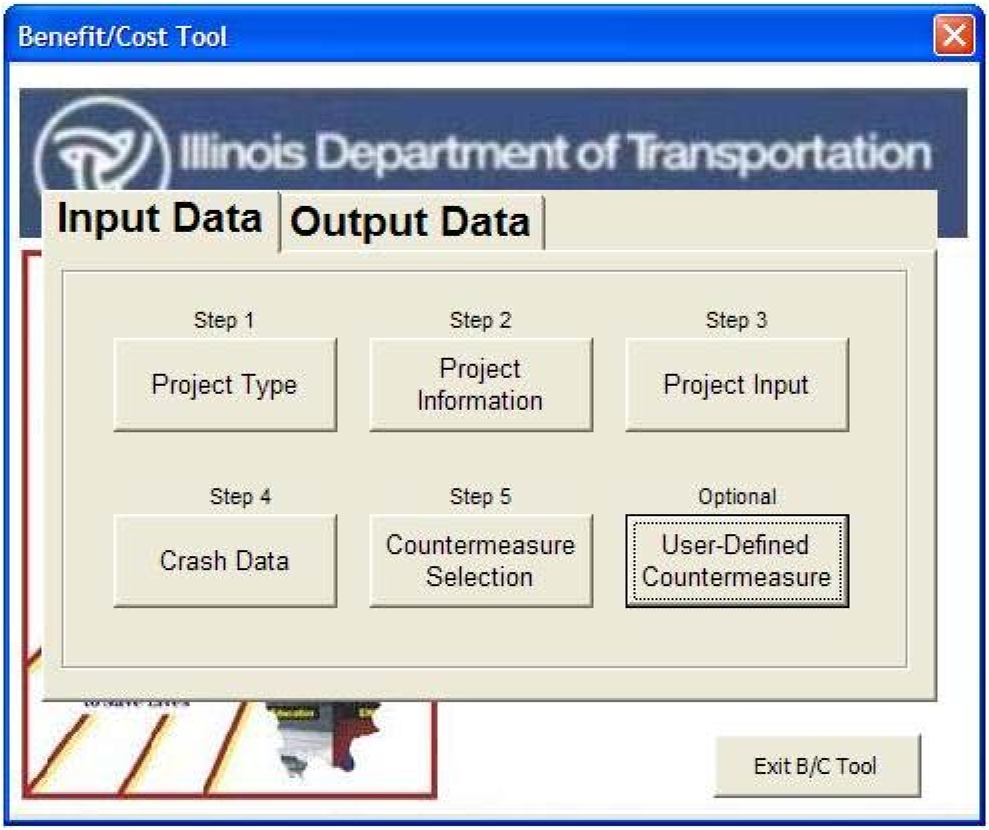
TABLE 2: SEGMENT COUNTERMEASURES

COUNTERMEASURES	Unit	Service Life	CRF	Crash Type Affected
2.1 Pavement Treatments				
2.1.1 Widening and Resurfacing or Widening alone	Miles	15	25%	All
skidproofing)				
2.5.6 Guardrail	Miles	10	40%	FO,OVT
2.5.7 Advance Warning Sign	Unit Qnty	5	20%	All
2.5.8 Chevrons or Delineators	Unit Qnty	4	40%	OVT,HO,SOD,FO
2.5.9 Relocation	Unit Qnty	15	45%	All
2.6 Roadside Safety				
2.6.1 General/Fixed Obstacle Removal	Unit Qnty	20	50%	FO,OVT
2.6.2 Curb Parking Removal	Unit Qnty	20	50%	PKV,RE,FO,OVT
2.6.3 Guardrail	Miles	10	15%	FO,OVT
2.6.4 Utility Adjustment	Miles	15	45%	FO,OVT involving utility hazards
2.6.5 Drainage Improvement	Miles	10	10%	All
2.6.7 Shoulder Improvement	Miles	5	10%	FO,OVT
2.6.8 Impact Attenuators	Miles	3	70%	FO,OVT
2.6.9 Glare Shields	Miles	10	15%	SSD,AG,FO,OVT
2.6.10 Fencing	Miles	10	15%	All
2.7 Other				
2.7.1 Turnouts (Mailbox or other)	Miles	15	50%	Entering or exiting vehicles from shoulder area
2.7.2 Ramp Improvement	Miles	15		Variable. See table in the HSIP Policy.
2.7.3 User defined 01				
2.7.4 User defined 02				
2.7.5 User defined 03				

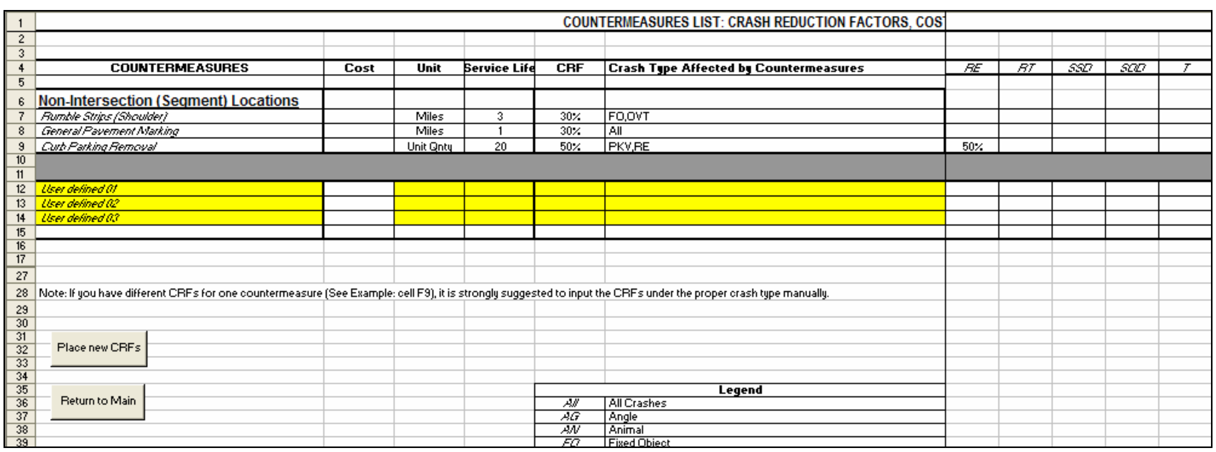


STEP 16: Select the appropriate countermeasures using the pull-down menu under the countermeasure tab. The tool allows for selection and analysis of up to 5 countermeasures for one project. After selecting the countermeasure, the CRF, crash type affected, service life and countermeasure units will automatically populate. Note that if only aggregate crash data are provided, the tool will only calculate a benefit for countermeasures that affect All Crash Types.

STEP 17: Enter the **Unit Cost** and **Quantity** for each countermeasure. For example, enter $10,000 and 1 if you are adding signing of this cost at one intersection. When complete, select **Return to Main.** Be sure to "enter" the last data entered by using the Enter key or clicking another cell before attempting to click the Return to Main button.



If you wish to add a countermeasure or use a countermeasure that is not listed, click on the Optional **User-Defined Countermeasure** button as shown in the above image.



COUNTERMEASURES LIST: CRASH REDUCTION FACTORS, COS

	COUNTERMEASURES	Cost	Unit	Service Life	CRF	Crash Type Affected by Countermeasures	RE	RT	SSD	SOD	T
6	Non-Intersection (Segment) Locations										
7	*Rumble Strips (Shoulder)*		Miles	3	30%	FO,OVT					
8	*General Pavement Marking*		Miles	1	30%	All					
9	*Curb Parking Removal*		Unit Qnty	20	50%	PKV,RE	50%				
12	*User defined 01*										
13	*User defined 02*										
14	*User defined 03*										

Note: If you have different CRFs for one countermeasure (See Example: cell F9), it is strongly suggested to input the CRFs under the proper crash type manually.

Place new CRFs

Return to Main

Legend	
All	All Crashes
AG	Angle
AN	Animal
FO	Fixed Object

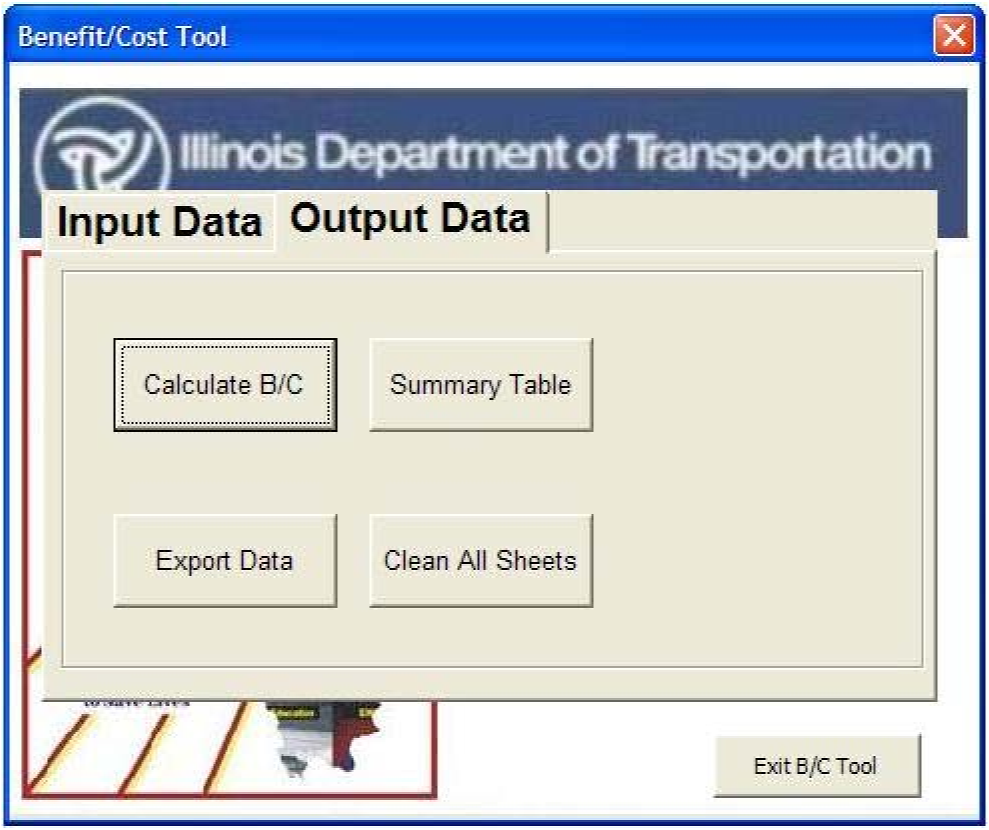
After selecting "User-Defined Countermeasure" the input box shown above will appear. The box shown is for segments, but a similar table will appear for intersections.

STEP 18: Enter the user-defined countermeasure description in the first box under countermeasures, shown in yellow. This box currently contains the text "User defined 01". Enter the unit of measurement, service life, CRF, and crash type affected to the right of the countermeasure description. Refer to the "Desktop Reference for Crash Reduction Factors" as discussed above to obtain CRF values. Crash Type Affected should be entered by using the abbreviations shown in the table below, separated by commas without spaces. Examples are shown in the window above the input data.

Legend	
All	All Crashes
AG	Angle
AN	Animal
FO	Fixed Object
HO	Head On
LT	Left Turn
OtherNC	Other Noncollision
OtherO	Other Object
OVT	Overturned
PD	Pedestrian
PDC	Pedalcyclist
PKV	Parked Vehicle
RE	Rear End
RT	Right Turn
SSD	Sideswipe Same Direction
SOD	Sideswipe Opposite Direction
T	Turning
TR	Train
NGT	Night Time crash
WP	Wet Pavement

STEP 19: After completing the user defined countermeasure information, select the "Place New CRFs" button. This will populate the CRFs to the appropriate crash types in the columns to the right of the input data. Additional user defined countermeasures can be added in the User defined02 and User defined 03 lines.

When complete select **Return to Main**.



When all input data has been completed, select the **Output Data** tab on the main menu and the screen shown above will appear.

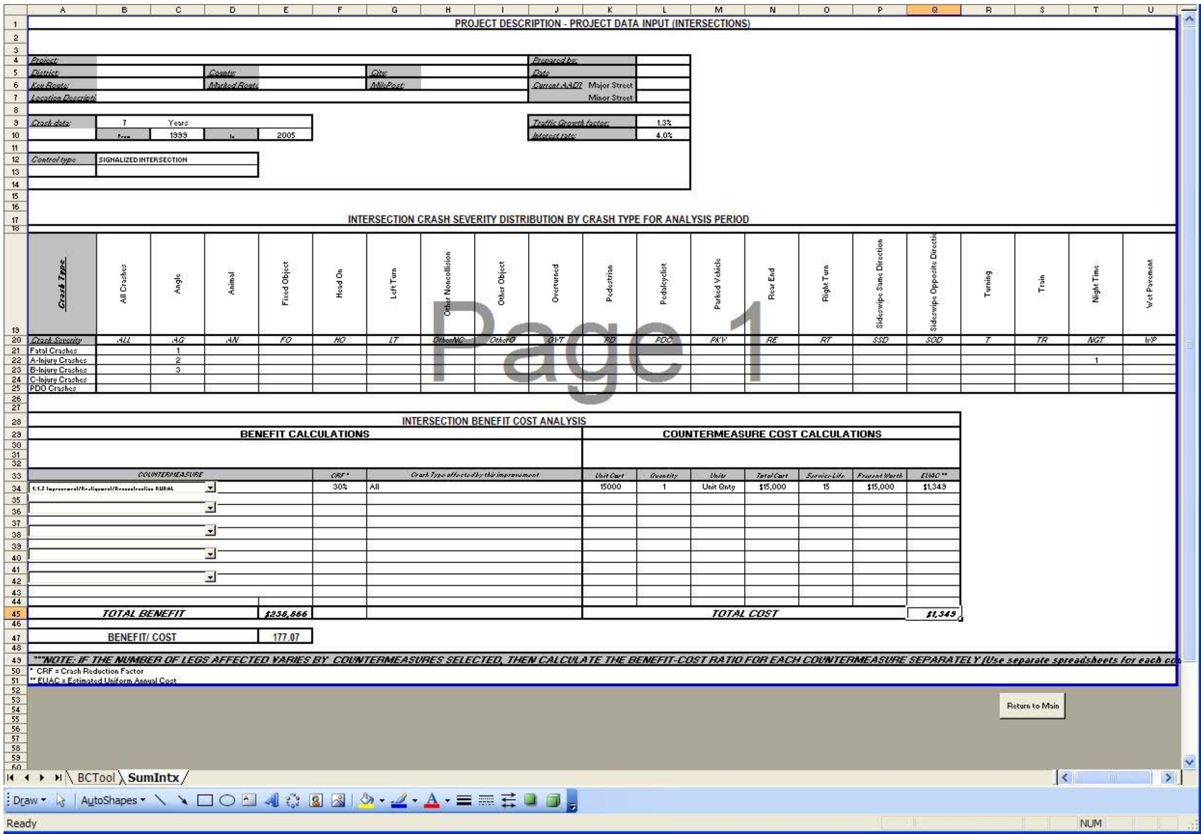
STEP 20: Click on the **Calculate B/C** button to obtain the benefit-cost ratio.

The image above will appear with the benefit /cost ratio for this project.

If you would like to test different countermeasure scenarios, you can go back to the **Input Data** tab, modify the input and re-run calculation of the B/C. This can be run as many times as desired to obtain the most favorable B/C ratio.

If you would like to erase and re-enter the crash data, select **Clean All Sheets**. The prompt will ask **Are you sure?** before deleting the information.

Select **Summary Table** to see a summary of the analysis or to verify inputs.



The above window will appear when “Summary Table” is selected.

If you would like to save the run, select **Export Data.** This will allow you to save the file with a new name. The file can be opened at a later date and modified if necessary.

3.0 Special Cases - Partial Application of Countermeasures

One may wish to consider applying a safety-based countermeasure to part but not all of a segment or intersection. For example, left turn lanes may be contemplated for one roadway but not the crossing facility at an intersection. Should this be the case, the analyst must take care to properly estimate expected benefits and calculate an appropriate B/C ratio.

Proper use of the tool for such cases requires the analyst perform the benefit calculation taking into account the specific countermeasure application. This means calculating benefits separately for each approach or segment, applying only those countermeasures that apply to that approach, and applying them only to the crashes associated with that approach or segment. The following procedure is suggested:

STEP ONE: Determine which countermeasures apply to each intersection approach or segment

STEP TWO: Identify or designate which crashes are associated with each segment (best practices would be to refer to a crash diagram), inputting only those crashes into the worksheet that apply to that segment

STEP THREE: Perform the procedure as outline in this guide, calculating total benefits and costs for each unique segment and approach. Take care to label the input as ‘approach A’ or ‘segment B’, etc.

STEP FOUR: Sum all benefits and all costs from each approach calculation, and calculate a single overall project B/C.

This procedure can apply where multiple countermeasures are being studied. For example, one countermeasure may apply to the entire segment but the second to only part or parts of the study area. Use the tool to compute benefits for each unique segment, identifying the proper countermeasures for each one.

Care should be taken in designating crashes to not ‘double count’ or apply any one crash or crash type to multiple segments. Similarly, costs by segment should be carefully assigned to avoid double counting.

Note that the tool output will provide a B/C ratio for each approach. This *should not be used* (i.e., it is not correct to ‘average’ the segment B/C ratios); rather only the costs and benefits provided in the output should be used to compute *one overall B/C ratio*.

4.0 Reading a Crash Report for Benefit-Cost Input Tool

Key input factors for the countermeasure tool are crash type, crash severity, weather condition and time of day. This section of the guide describes the approach for obtaining information from the crash report to include in the benefit-cost tool. A sample crash report is shown on pages 27 and 28 and pages 29 and 30 show copies of templates that are used to translate crash reports. Actual templates have windows and are sized to be placed on top of a crash report.

Crash type – This is coded as type of first crash (COLL) and is shown in the upper row in the fifth box from the left. In this example the crash type is "6". Using template 1, "6" translates to a fixed object crash. The crash type should always be compared to the narrative on the back of the crash report which is shown on page 28. The narrative provides a detailed description of the crash so that the reviewer can gain a better understanding of the conditions and validate the crash type coding.

Crash severity – Injury type is coded in the middle of the crash report to the right of the description of Unit 1. In this example the injury was "K" or fatal. "A" is an incapacitating injury, "B" is a noncapacitating injury, "C" is reported, but not evident, and "0" is no indication of injury. If there are multiple vehicles involved in the crash use the most severe injury type to describe the crash severity.

Weather condition – To determine if the pavement was wet during this crash refer to the column on the right of the report. The sixth entry from the top is labeled "RSUR" and reflects the roadway surface condition. In this example a "1" refers to dry pavement.

Night time crashes – To determine if this crash occurred at night, refer to the top line sixth box from the left labeled "LGHT". This refers to the lighting condition. For this example "4" indicates "darkness". Therefore, night time crashes should be selected.

ILLINOIS TRAFFIC CRASH REPORT Sheet __ of __ Sheets

Atty. C. Walker 10/00

Kiyh Sedgwick 11/2001

DRAC	PEDV	TRFD	TRFC	WEAT	DRVA	VIS	VEHD	LGHT	COLL	MANV	PPA	PPL
U1 7 U2 X	X	1	1	1	U1 4 U2 X	U1 1 U2 X	U1 1 U2 X	4	6	U1 15 U2 X	X	X

* 5 1 0 2 7 7 6 *

INVESTIGATED BY: Fulton Co Sheriff POLICE

TYPE OF REPORT: ■ ON-SCENE ☐ NOT ON-SCENE ☐ SUPPLEMENTARY

☐ A No Injury / Drive Away ■ B Injury and / or Tow Due To Crash

AGENCY CRASH REPORT NO. 01 7022

137/301-1 6

ADDRESS NO. (OPTIONAL) — HIGHWAY or STREET NAME: NB Co Hwy 24

CITY/TOWNSHIP (CIRCLE): Farmington — COUNTY: Fulton 29

INTERSECTION RELATED ☐ Yes ■ No — PRIVATE PROPERTY ■ Yes (No) — HIT & RUN ☐ Yes ■ No

DATE OF CRASH 09/27/01 — TIME 1:30 ■ AM ☐ PM — LARS CODE

ANY SINGLE VEHICLE/PROPERTY DAMAGED OVER $500 ■ Yes ☐ No — NO. MOTOR VEHICLES INVLD — LARS CODE

.2 FT / (M) N E (S) W — Cottonwood Rd (NAME OF INTERSECTION OR ROAD FEATURE) ☐ AT INTERSECTION WITH

TRFW 1 — VEHT U1 15 U2 X — NO LANES 2 — ALGN 6 — RSUR 1 — VEHU U1 2 U2 X — RDEF 1 — BAC U1 96 U2 X — NO. OCCS U1 1 U2 X — DIRP U1 1 U2 X

UNIT 1

NAME (LAST, FIRST, M.I.) ■ DRIVER: [redacted]

DATE OF BIRTH 02/06/79 — SEX M — SAFT 2 — AIR 9 — INJURY K — EJECT 2 — STATE Il — CLASS D

MAKE Jeep — MODEL Grd Cherokee — YEAR 2000 — STATE Il [redacted]

CIRCLE NUMBER(S) FOR DAMAGED AREA(S): 00 - NONE, 10 - UNDER CARRIAGE, 11 - TOTAL (ALL AREAS), 12 - OTHER, 99 - UNKNOWN — POINT OF CONTACT 11 — INSURANCE CO.

TOWED DUE TO DAMAGE ■ Y — OTHER — FIRE ■ — HAZ MAT ■ — COM VEH ■

TAKEN TO Proctor — EMS AGENCY Fulton

UNIT 2

[redacted]

DATE OF BIRTH / / — SEX — SAFT — AIR — INJURY — EJECT — STATE — CLASS — MAKE — MODEL — YEAR — STATE

CIRCLE NUMBER(S) FOR DAMAGED AREA(S): 00 - NONE, 10 - UNDER CARRIAGE, 11 - TOTAL (ALL AREAS), 12 - OTHER, 99 - UNKNOWN — POINT OF CONTACT — INSURANCE CO.

TOWED DUE TO DAMAGE — OTHER — FIRE — HAZ MAT — COM VEH

TAKEN TO — EMS AGENCY — OWNER ADDRESS (street, city, state, zip) — TELEPHONE — POLICY NO.

[UNIT] [SEAT] [DOB] [SEX] [SAFT] [AIR] [INJ] [EJECT] [redacted] [HOSP] [EMS]

	EVNO	(MOST)	EVNT	LOC
UNIT 1	1	☐	1	3
	2	☐	37	3
	3	■	2	3
UNIT 2	1	☐		
	2	☐		
	3	☐		

[redacted] DAMAGED PROPERTY — ton Il 61531 — SECTION — CITATION NO.

DATE POLICE NOTIFIED 09/27/01 — TIME NOTIFIED 6:30 ■ AM ☐ PM — COURT DATE — COURT TIME

P1099

OFFICER ID 42 — SIGNATURE — BEAT / DIST. N — SUPERVISOR ID Sgt R Stewart #8

*IF YES, COMPLETE COMMERCIAL VEHICLE AREA ON BACK OF FORM

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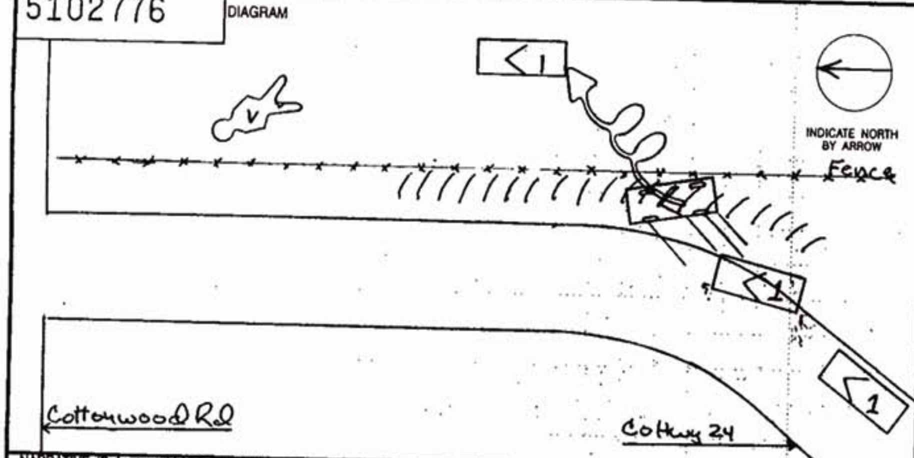
SR 1050 200M (REPRINT 10/00)

5102776

DIAGRAM



NARRATIVE (Refer to vehicle by Unit No.)

Unit#1 was NB on Co Hwy 24 .2 mi S. of Cottonwood Rd at this point Unit#1 left the roadway to the East. Unit#1 was skidding broadside and struck the embankment. Upon impact Unit#1 became airborne continuing E. into a soybean field. Unit#1 rolled over approx. 3 times. Unit#1 Driver was ejected from Unit#1 and was found approx 100' from Unit#1 to the North

COMMERCIAL VEHICLE — UNIT NO.

CARRIER NAME
ADDRESS
CITY — STATE — ZIP
SOURCE: Side of truck / Papers / Driver / Log book
ID NUMBER — GVWR
US DOT or State No. — ICCMC State Name — None
HAZARDOUS MATERIALS: If Yes: 4-Digits — 1-Digit — or Name — PLACARDED? Yes / No
Hazardous cargo released from truck? (do not count fuel from vehicle fuel tank) — Y N Unk
Violation of HAZMAT regs. contribute to crash?
Violation of MCS regs. contribute to crash?
Inspection form completed? Y N Unk — HAZMAT / MCS — Out of Service? Y N — Form No.
IDOT PERMIT # — WIDE LOAD Y N
TRAILER WIDTH(S): 0-96" / 97-102" / Over 102" — Trailer 1 / Trailer 2
TRAILER LENGTH(S) - ft: Trailer 1 / Trailer 2
VEHICLE LENGTH (TOTAL) - ft
NO. OF AXLES
IN CITY OF / NEAREST CITY: — Miles N E S W of: (Circle)
INSERT APPLICABLE NUMBERS FROM CHOICES ON BACK OF TEMPLATE TWO
VEHICLE CONFIGURATION — CARGO BODY TYPE — LOAD TYPE

COMMERCIAL VEHICLE — UNIT NO.

CARRIER NAME
ADDRESS
CITY — STATE — ZIP
SOURCE: Side of truck / Papers / Driver / Log book
ID NUMBER — GVWR
US DOT or State No. — ICCMC State Name — None
HAZARDOUS MATERIALS: If Yes: 4-Digits — 1-Digit — or Name — PLACARDED? Yes / No
Hazardous cargo released from truck? (do not count fuel from vehicle fuel tank) — Y N Unk
Violation of HAZMAT regs. contribute to crash?
Violation of MCS regs. contribute to crash?
Inspection form completed? Y N Unk — HAZMAT / MCS — Out of Service? Y N — Form No.
IDOT PERMIT # — WIDE LOAD
TRAILER WIDTH(S): 0-96" / 97-102" / Over 102" — Trailer 1 / Trailer 2
TRAILER LENGTH(S) - ft: Trailer 1 / Trailer 2
VEHICLE LENGTH (TOTAL) - ft
NO. OF AXLES
IN CITY OF / NEAREST CITY: — Miles N E S W of: (Circle)
INSERT APPLICABLE NUMBERS FROM CHOICES ON BACK OF TEMPLATE TWO
VEHICLE CONFIGURATION — CARGO BODY TYPE — LOAD TYPE

ILLINOIS TRAFFIC CRASH REPORT

TEMPLATE 1

EVENT (EVNT)

NONCOLLISION:
1 Ran off the roadway
2 Overturn
3 Fire/explosion
4 Immersion
5 Jackknife
6 Cargo shift/loss
7 Separation
8 Downhill runaway
9 Other noncollision
99 Unknown

COLLISION WITH:
NOT FIXED OBJECTS:
11 Motor vehicle in traffic
12 Pedestrian
13 Pedalcyclist
14 Railway train
15 Deer
16 Other animal
17 Falling load
18 Parked vehicle
19 Thrown/falling object
20 Other object
99 Unknown

FIXED OBJECTS:
21 Crash cushion
22 Guardrail face
23 Guardrail end
24 Concrete med. barrier
25 Bridge support
26 Bridge end
27 Bridge rail
28 Bridge underside
29 Traffic signal
30 Light support
31 Utility pole
32 Delineator post
33 Railroad signal/gates
34 Other pole or post
35 Culvert
36 Curb
37 Ditch/embankment
38 Snowbank
39 Fence
40 Mailbox
41 Tree or shrub
42 Building/structure
43 Other fixed object
99 Unknown

EVENT NUMBER (EVNO)
CHECK MOST SEVERE NUMBER (MOST)
Unit No

WEATHER CONDN. (WEAT)
1 Clear
2 Rain
3 Snow
4 Fog/smoke/haze
5 Sleet/hail
6 Severe cross wind
7 Other
9 Unknown

TRAFFIC CONTROL DEVICE (TRFD)
1 No controls
2 Stop sign/flasher
3 Traffic signal
4 Yield
5 Police/flagman
6 RR crossing gate
7 Other RR crossing
8 School zone
9 No passing
10 Other reg. sign
11 Other warning sign
12 Lane use marking
13 Other
99 Unknown

DEVICE CONDN. (TRFC)
1 No controls
2 Not functioning
3 Functioning improperly
4 Functioning properly
5 Worn reflect. material
6 Missing
7 Other
9 Unknown

LIGHTING CONDN. (LGHT)
1 Daylight
2 Dawn
3 Dusk
4 Darkness
5 Darkness, lighted road
9 Unknown

EVENT LOCATION (LOC)
1 On pavement (roadway)
2 Off pavement - left
3 Off pavement - right
4 Intersection
5 Other
9 Unknown

TYPE OF FIRST CRASH (COLL)

SINGLE VEHICLE CRASH	MULTI VEHICLE CRASH	
Select a code for a Single Vehicle Crash based on the crash code that illustrates what caused the **first damage/injury**, not what caused the **most** severe damage/injury.	The intended direction of travel of each motor vehicle prior to the onset of the crash should determine the selection of the Multi Vehicle Crash code, **not** the direction of travel or position/angle of the vehicle at the point of contact. If the **first damage/injury occurs when two vehicles strike, you must select a code 9-15.**	
1 Pedestrian	9 Parked motor vehicle	
2 Pedalcyclist	10 Turning (at least one vehicle turning)	11 Rear end
3 Train		
4 Animal	12 Sideswipe same direction	13 Sideswipe opposite direction
5 Overturned		
6 Fixed object		
7 Other object	14 Head on	15 Angle
8 Other noncollision		
Example: A motor vehicle skids on ice, loses control and strikes a guardrail. The COLL code should be **6 - Fixed object** because no damage occurred until the guardrail was struck.	Example: Unit 1 is NB and Unit 2 is SB on a four-lane divided roadway. Unit 1 skids on ice, loses control, crosses the grass median, re-enters the roadway into oncoming traffic, and collides with Unit 2. The **COLL** code should be **14 - Head on** because no damage occurred until the two units collided.	

PED/PEDAL LOCATION (PPL)
1 In roadway
2 In crosswalk
3 Not in available crosswalk
4 Crosswalk not available
5 Driveway access
6 Not in roadway
9 Unknown/NA

PED/PEDAL ACTION (PPA)
3 Turning left
4 Turning right
20 Enter from drive/alley
50 No action
51 Crossing - with signal
52 Crossing - against signal

ENTERING / LEAVING / CROSSING
53 School bus (within 50 ft.)
54 Parked vehicle
55 Not at intersection

WALKING / RIDING
56 With traffic
57 Against traffic
58 To/from disabled vehicle

OTHER:
59 Waiting for school bus
60 Playing/working on vehicle
61 Playing in roadway
62 Standing in roadway
63 Working in roadway
64 Other action
99 Unknown/NA

CRASH DATA SAVES LIVES!

VEHICLE TYPE (VEHT)
1 Passenger
2 Pickup
3 Van/mini-van
4 Bus up to 15 pass.
5 Bus over 15 pass.
6 Truck - single unit
7 Tractor w/ semi-trailer
8 Tractor w/o semi-trailer
9 Farm equipment
10 Motorcycle (over 150cc)
11 Motor driven cycle
12 Snowmobile
13 All-terrain vehicle (ATV)
14 Other vehicle with trailer
15 Sport utility vehicle (SUV)
16 Other
99 Unknown/NA

VEHICLE USE (VEHU)
1 Not in use
2 Personal
3 Driver education
4 Ambulance
5 Fire
6 Police
7 School bus
8 CTA
9 Mass transit
10 Other transit
11 Military
12 Agriculture
13 Tow truck
14 Construction/maintenance
15 House trailer
16 Camper/RV - towed/multi-unit
17 Camper/RV - single unit
18 Taxi/for hire
20 Commercial - multi-unit
21 Commercial - single unit
22 State owned
98 Other
99 Unknown/NA

NUMBER OF OCCUPANTS (NO. OCCS)

DIRECTION TRAVEL PRIOR (DIRP)
1 N, 2 NE, 3 E, 4 SE, 5 S, 6 SW, 7 W, 8 NW

VEHICLE MANEUVER PRIOR (MANV)
1 Straight ahead
2 Passing/overtaking
3 Turning left
4 Turning right
5 Turning on red
6 U-turn
7 Starting in traffic
8 Slow/stop - left turn
9 Slow/stop - right turn
10 Slow/stop - load/unload
11 Slow/stop in traffic
12 Driving wrong way
13 Changing lanes
14 Avoiding vehicles/objects
15 Skidding/ control loss
16 Entering traffic lane from parking
17 Leaving traffic lane to park
18 Merging
19 Diverging
20 Enter from drive/alley
21 Parked
22 Parked in traffic lane
23 Backing
24 Driverless
25 Other
26 Negotiating a curve
99 Unknown/NA

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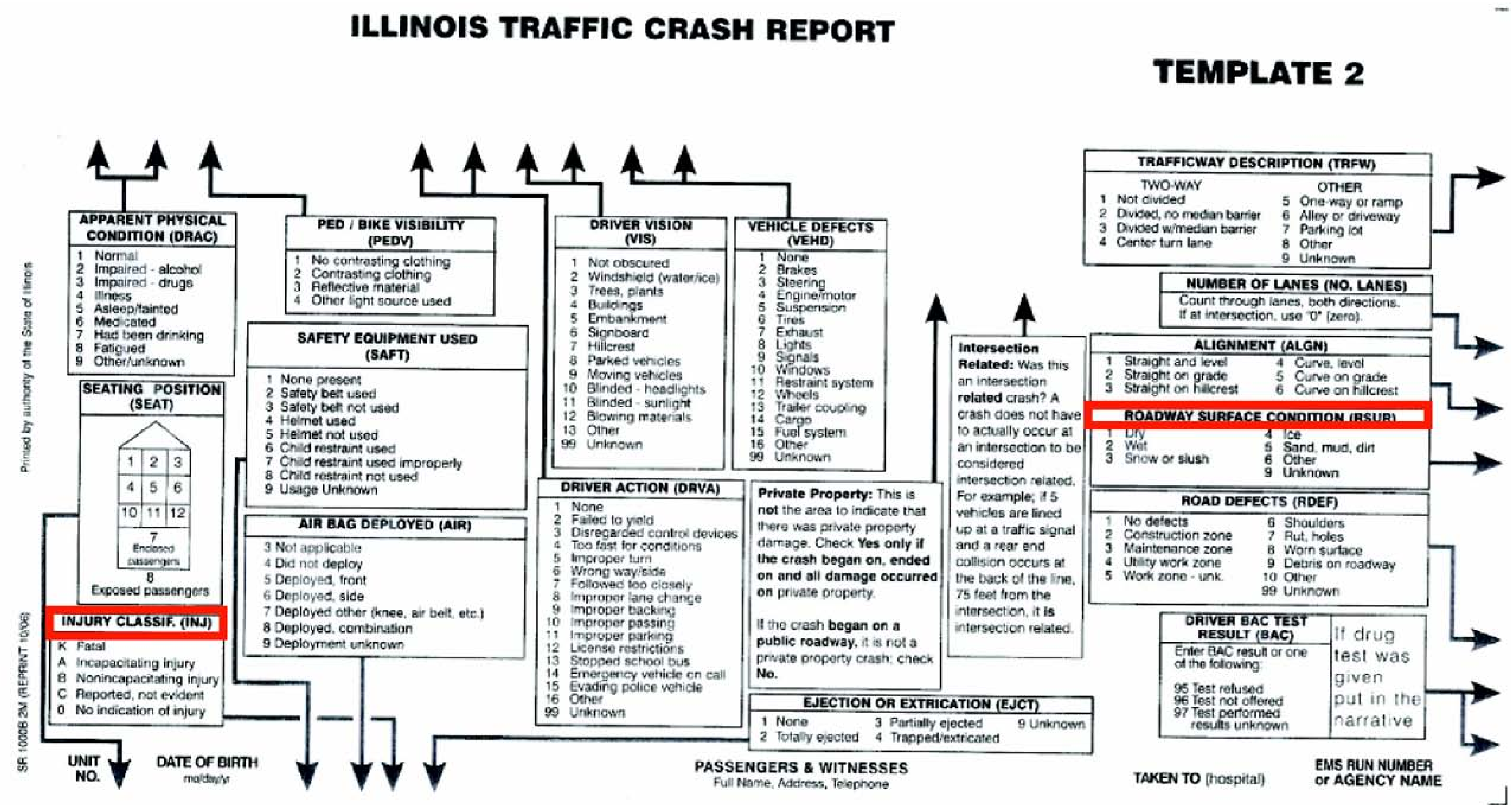

ILLINOIS TRAFFIC CRASH REPORT

TEMPLATE 2

APPARENT PHYSICAL CONDITION (DRAC)
1 Normal
2 Impaired - alcohol
3 Impaired - drugs
4 Illness
5 Asleep/fainted
6 Medicated
7 Had been drinking
8 Fatigued
9 Other/unknown

SEATING POSITION (SEAT)

1	2	3
4	5	6
10	11	12

7 Enclosed passengers
8 Exposed passengers

INJURY CLASSIF. (INJ)
K Fatal
A Incapacitating injury
B Nonincapacitating injury
C Reported, not evident
0 No indication of injury

PED / BIKE VISIBILITY (PEDV)
1 No contrasting clothing
2 Contrasting clothing
3 Reflective material
4 Other light source used

SAFETY EQUIPMENT USED (SAFT)
1 None present
2 Safety belt used
3 Safety belt not used
4 Helmet used
5 Helmet not used
6 Child restraint used
7 Child restraint used improperly
8 Child restraint not used
9 Usage Unknown

AIR BAG DEPLOYED (AIR)
3 Not applicable
4 Did not deploy
5 Deployed, front
6 Deployed, side
7 Deployed other (knee, air belt, etc.)
8 Deployed, combination
9 Deployment unknown

DRIVER VISION (VIS)
1 Not obscured
2 Windshield (water/ice)
3 Trees, plants
4 Buildings
5 Embankment
6 Signboard
7 Hillcrest
8 Parked vehicles
9 Moving vehicles
10 Blinded - headlights
11 Blinded - sunlight
12 Blowing materials
13 Other
99 Unknown

VEHICLE DEFECTS (VEHD)
1 None
2 Brakes
3 Steering
4 Engine/motor
5 Suspension
6 Tires
7 Exhaust
8 Lights
9 Signals
10 Windows
11 Restraint system
12 Wheels
13 Trailer coupling
14 Cargo
15 Fuel system
16 Other
99 Unknown

DRIVER ACTION (DRVA)
1 None
2 Failed to yield
3 Disregarded control devices
4 Too fast for conditions
5 Improper turn
6 Wrong way/side
7 Followed too closely
8 Improper lane change
9 Improper backing
10 Improper passing
11 Improper parking
12 License restrictions
13 Stopped school bus
14 Emergency vehicle on call
15 Evading police vehicle
16 Other
99 Unknown

Private Property: This is not the area to indicate that there was private property damage. Check **Yes only if the crash began on, ended on and all damage occurred on private property.**

If the crash **began on a public roadway**, it is not a private property crash; check **No.**

Intersection Related: Was this an intersection **related** crash? A crash does not have to actually occur at an intersection to be considered intersection related. For example; if 5 vehicles are lined up at a traffic signal and a rear end collision occurs at the back of the line, 75 feet from the intersection, it **is** intersection related.

EJECTION OR EXTRICATION (EJCT)
1 None
2 Totally ejected
3 Partially ejected
4 Trapped/extricated
9 Unknown

TRAFFICWAY DESCRIPTION (TRFW)
TWO-WAY
1 Not divided
2 Divided, no median barrier
3 Divided w/median barrier
4 Center turn lane
OTHER
5 One-way or ramp
6 Alley or driveway
7 Parking lot
8 Other
9 Unknown

NUMBER OF LANES (NO. LANES)
Count through lanes, both directions.
If at intersection, use "0" (zero).

ALIGNMENT (ALGN)
1 Straight and level
2 Straight on grade
3 Straight on hillcrest
4 Curve, level
5 Curve on grade
6 Curve on hillcrest

ROADWAY SURFACE CONDITION (RSUR)
1 Dry
2 Wet
3 Snow or slush
4 Ice
5 Sand, mud, dirt
6 Other
9 Unknown

ROAD DEFECTS (RDEF)
1 No defects
2 Construction zone
3 Maintenance zone
4 Utility work zone
5 Work zone - unk.
6 Shoulders
7 Rut, holes
8 Worn surface
9 Debris on roadway
10 Other
99 Unknown

DRIVER BAC TEST RESULT (BAC)
Enter BAC result or one of the following:
95 Test refused
96 Test not offered
97 Test performed results unknown

If drug test was given put in the narrative

UNIT NO.
DATE OF BIRTH mo/day/yr
PASSENGERS & WITNESSES
Full Name, Address, Telephone
TAKEN TO (hospital)
EMS RUN NUMBER or AGENCY NAME

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5.0 Examples

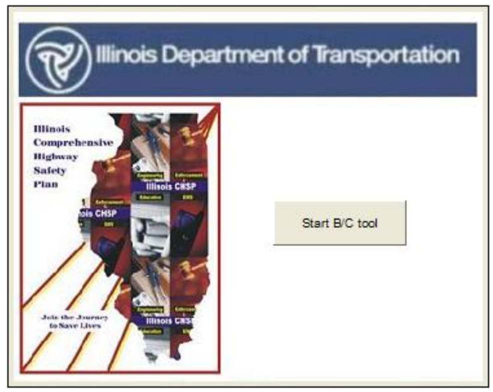
5.1 Case Study 1: Benefit Cost Analysis for a Segment.

The roadway segment along IL 0 between Maple Street and Oak Street was identified as a hazardous location. It is located in District 10, Wooded County, in the Village of Forest. From 2001 to 2005 there were 3 fatal crashes, 6 A-injury crashes, and 10 B-injury crashes. There were also C- injury and property damage only crashes at this location, but the exact number is not needed for the analysis. There are 3 night time crashes, 1 A-injury and 2 B-injury. A majority of the crashes were fixed object and overturn. The current AADT is 9500.

Countermeasures were reviewed and benefit-cost calculations were conducted to select the recommended solution. This example reflects the step-by-step procedure for calculating the benefit-cost ratio for adding rumble strips to the existing shoulder.

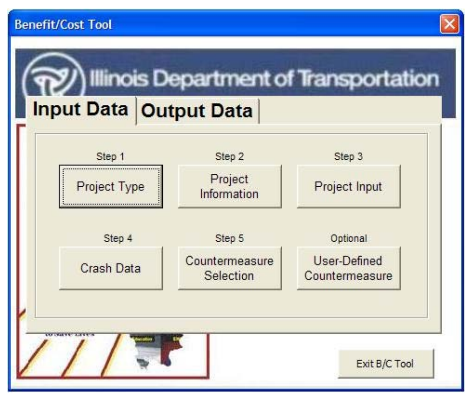
Step-by-Step Procedures

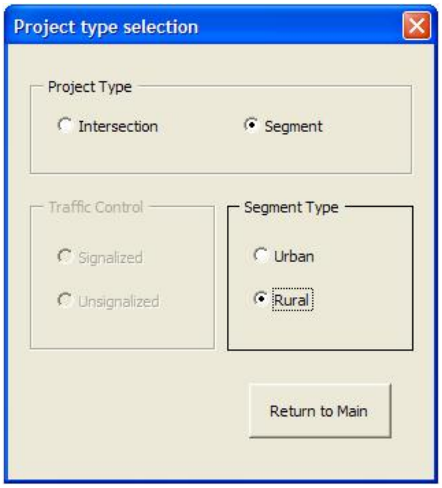
STEP 1: Start by pressing the **Start B/C Tool** button.



STEP 2: Select the **Input Data** tab.

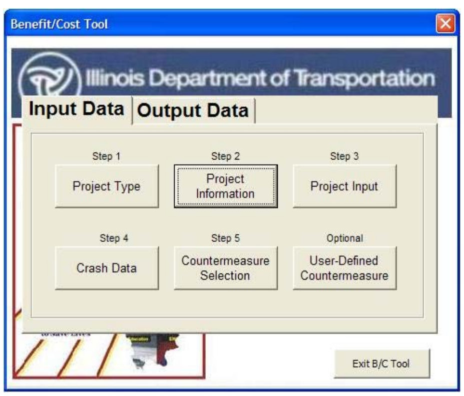
STEP 3: Select the button labeled **Project Type**





STEP 4: Select project type by clicking on the circle next to **Segment.** Select **Rural** under Segment Type.

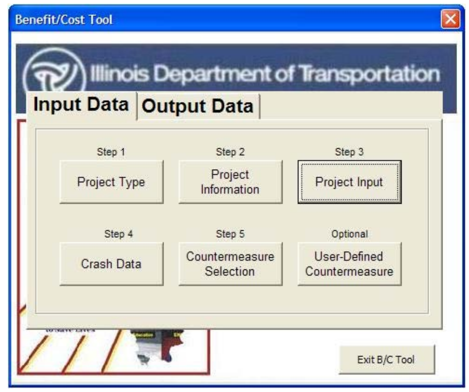
When complete click on the **Return to Main** button to return to the main input window.



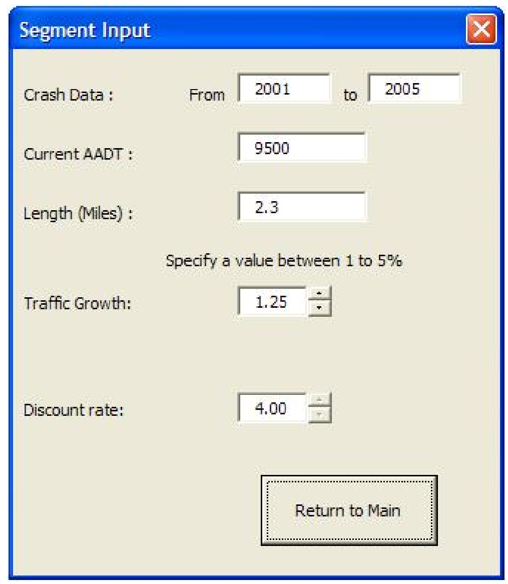
STEP 5: On the main menu, select the button labeled **Project Information**.

STEP 6: Complete the information in the boxes as shown. When all fields have been completed, click on **Return to Main**.

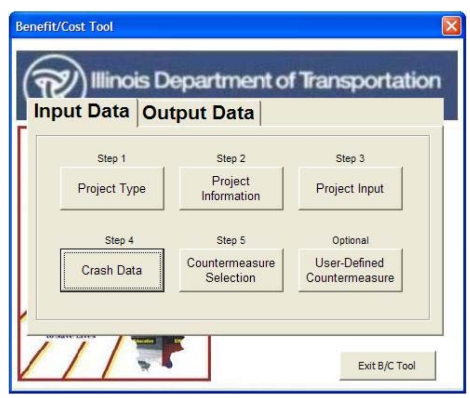
STEP 7: Select the button labeled **Project Input**.

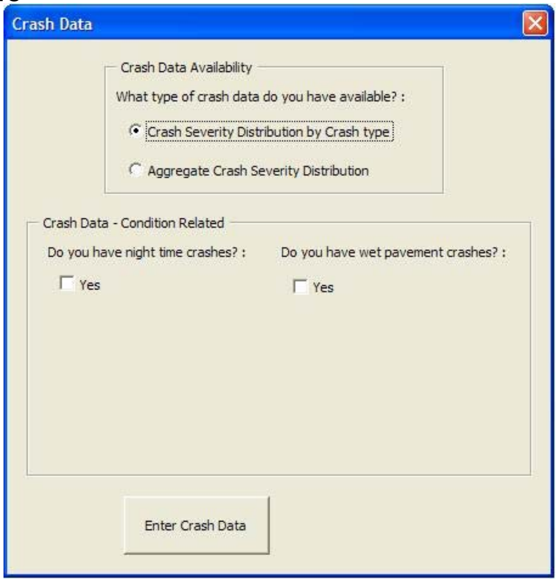


STEP 8: Input the information requested in the fields of the **Segment Input** window. When complete with all fields click on **Return to Main**.



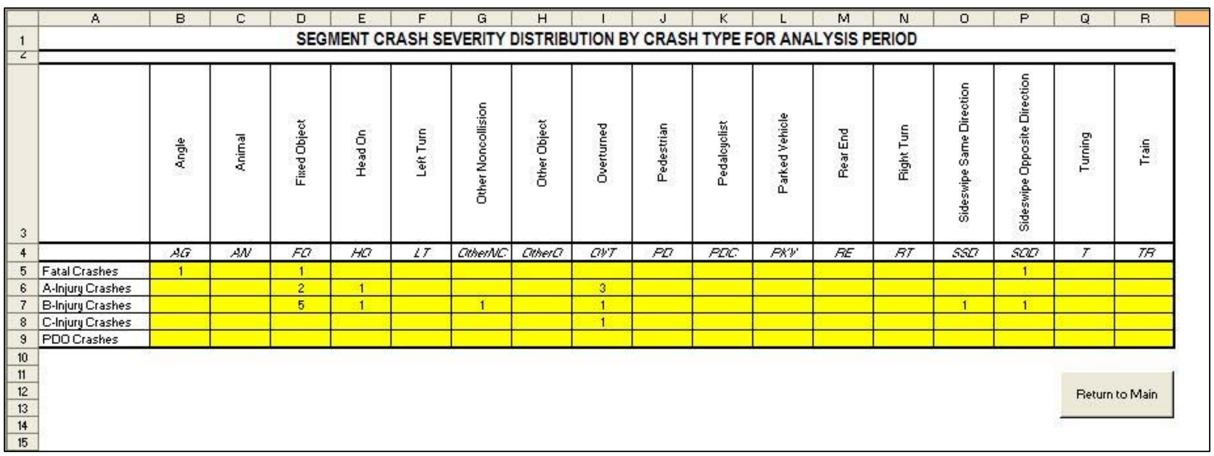
STEP 9: Select the button labeled **Crash Data**.





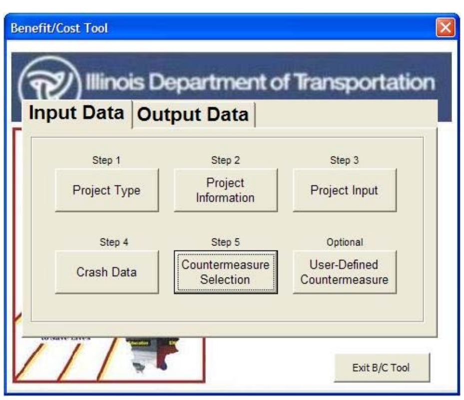
STEP 10: Select **Crash Severity Distribution by Crash Type** by clicking on the circle next to the text. When complete, select the **Enter Crash Data** button.

STEP 11: Enter the crash data for the analysis period by crash type and severity as shown. When complete, select the **Return to Main** button



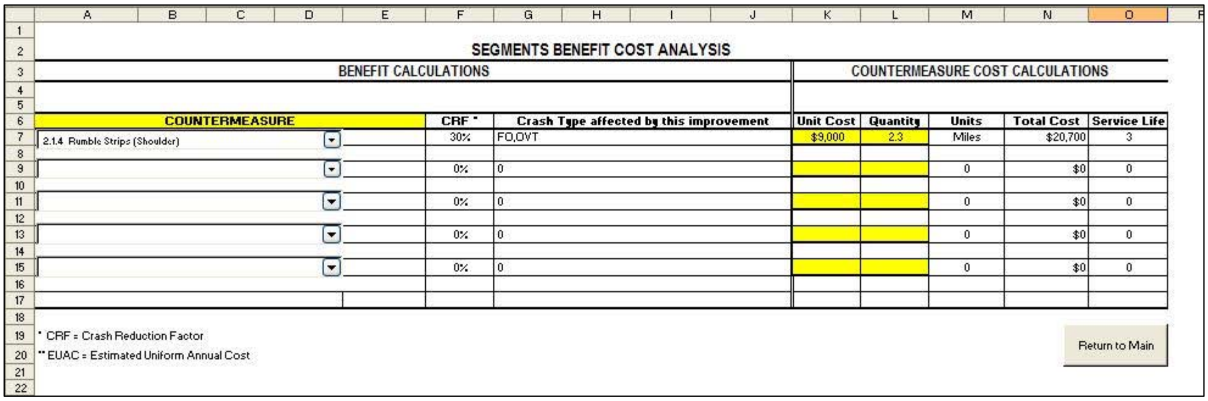
SEGMENT CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD

	Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overturned	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train
	AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	RT	SSD	SOD	T	TR
Fatal Crashes	1		1												1		
A-Injury Crashes			2	1				3									
B-Injury Crashes			5	1		1		1						1	1		
C-Injury Crashes								1									
PDO Crashes																	



STEP 12: Select the button labeled **Countermeasure Selection**.

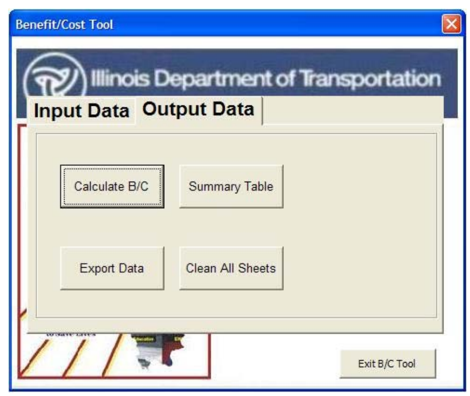
STEP 13: Select 2.1.4 Rumble Strips (Shoulder) from the countermeasure dropdown menu.



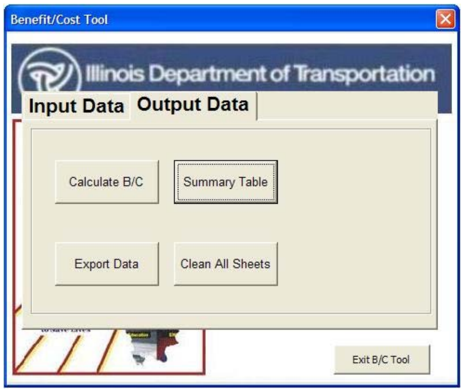
STEP 14: Enter the **Unit Cost** and **Quantity** for the selected countermeasure. When complete, select **Return to Main.**

When all input data has been completed, select the **Output Data** tab on the main menu and the screen shown below will appear.

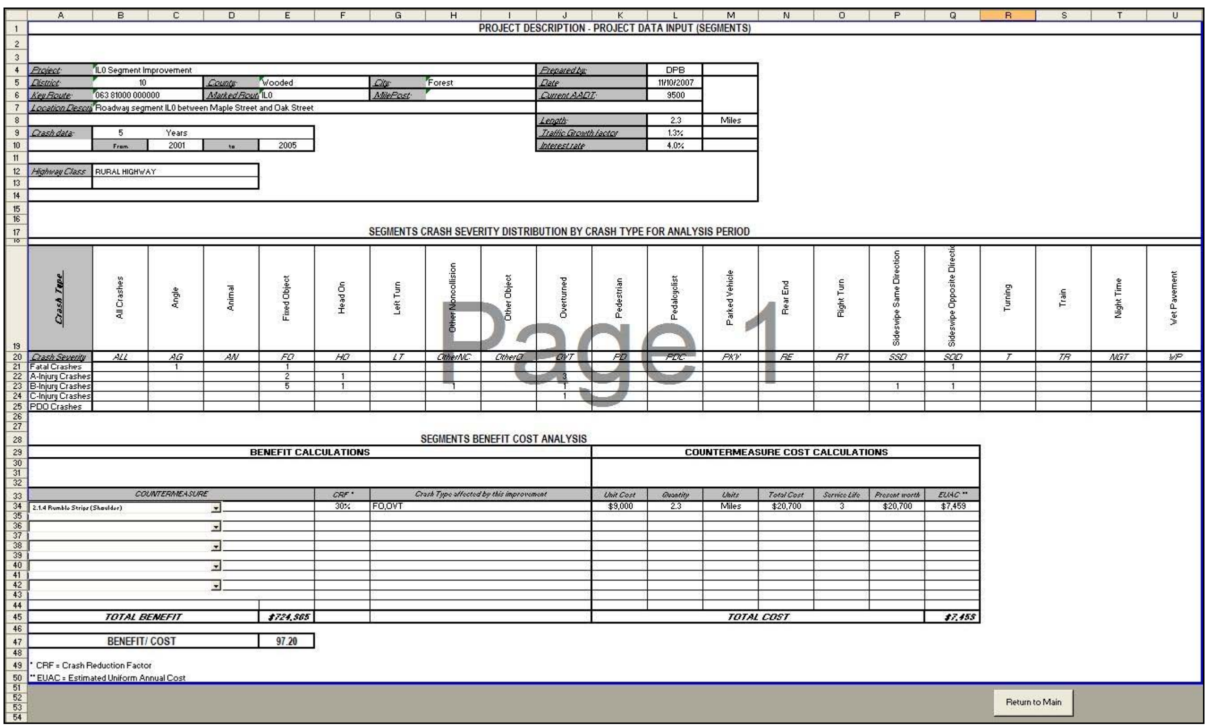
STEP 15: Click on the **Calculate B/C** button to obtain the benefit-cost ratio.



The image to the right will appear with the benefit /cost ratio for this project. Click the **OK** button to return to the main menu.



STEP 16: Select **Summary Table** to see a summary of the analysis or to verify inputs.



The above window will appear when "Summary Table" is selected.

If you would like to save the run, select **Export Data.** This will allow you to save the file with a new name. The file can be opened at a later date and modified if necessary.

5.2 Case Study 2: Benefit Cost Analysis for a Signalized Intersection.

The signalized intersection of Maple Street and Oak Street was identified as a hazardous location. It is located in District 0, Wooded County, in the Village of Forest. From 2001 to 2005 there was 2 fatal crash, 38 A-injury crashes, and 63 B-injury crashes. There were also C-injury and property damage only crashes at this location. A majority of the crashes were angle and turning with turning representing the most severe crash type.

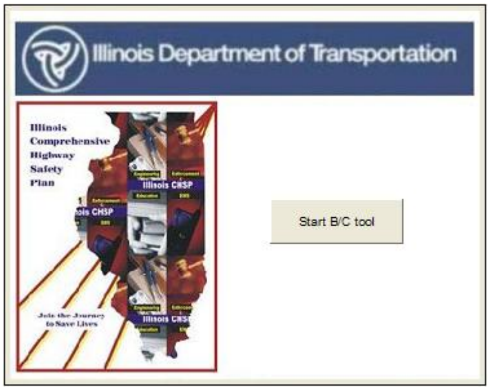
A road safety assessment was conducted and it was determined that there was a high left turn volume from a shared thru lane. The traffic signal heads were also difficult to see from a distance.

Countermeasures were reviewed and benefit-cost calculations were conducted to select the recommended solution. This example reflects the step-by-step procedure for calculating the benefit-cost ratio for adding two countermeasures; an increase in the signal lens size to 12 inches for the entire intersection and a left turn lane with a left turn phase for two legs of the intersection. For this example the benefit-cost is calculated twice because intersection legs are being treated differently. After tool calculations are made, an external calculation must be made to obtain a final composite benefit-cost ratio.

In this example, the first b/c calculation will be for treatment of two legs of the intersection with the increase in signal lens size. The second calculation will be for treatment of the other two legs of the intersection with an increase in signal lens size and the addition of left turn lanes.

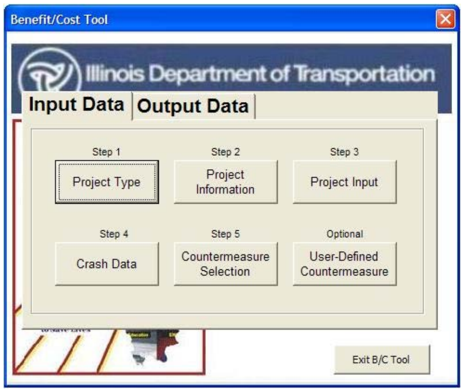
Step-by-Step Procedures

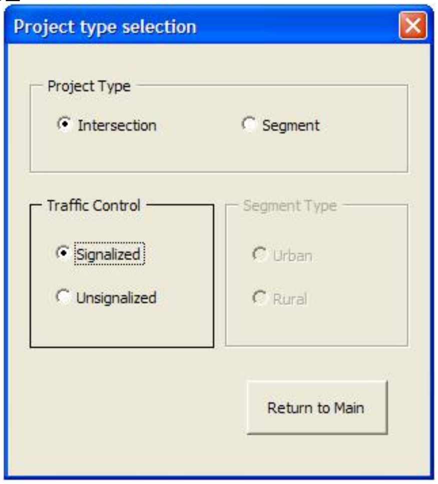
STEP 1: Start by pressing the **Start B/C Tool** button.



STEP 2: Select the **Input Data** tab.

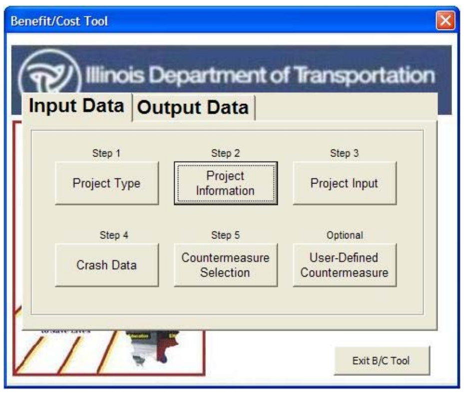
STEP 3: Select the button labeled **Project Type**



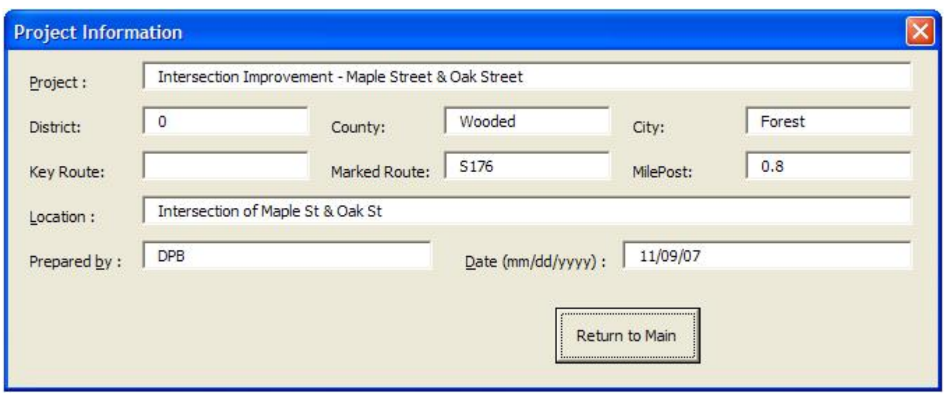


STEP 4: Select project type by clicking on the circle next to **Intersection** then select **Signalized.**

When complete click on the **Return to Main** button to return to the main input window.

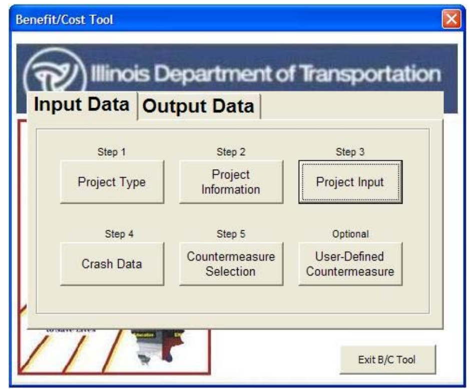


STEP 5: On the main menu, select the button labeled **Project Information**.

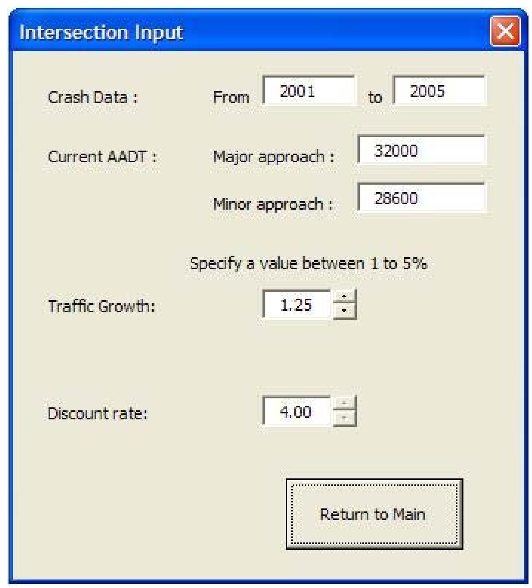


STEP 6: Complete the information in the boxes as shown. When all fields have been completed, click on **Return to Main**.

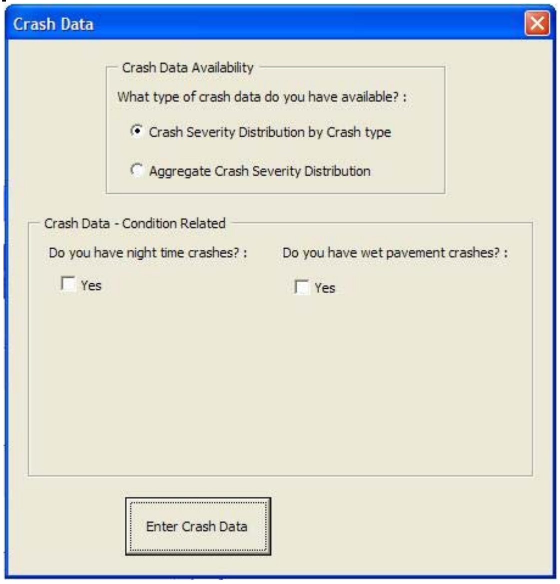
STEP 7: Select the button labeled **Project Input**.



STEP 8: Input the information requested in the fields of the **Intersection Input** window. When complete with all fields click on **Return to Main**.



STEP 9: Select the button labeled **Crash Data**.



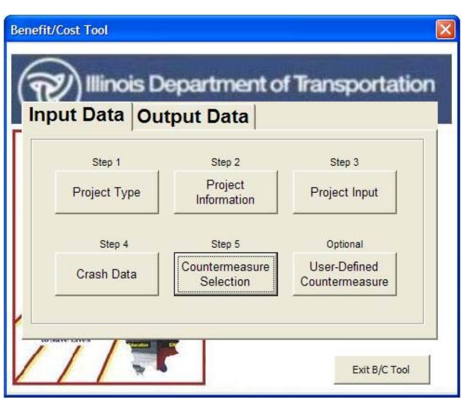
STEP 10: Select **Crash Severity Distribution by Crash Type** by clicking on the circle next to the text. When complete, select the **Enter Crash Data** button

STEP 11: Enter the crash data for the analysis period by crash type and severity as shown. Crash data entered should only be for the two legs of the intersection that are going to be treated with increasing the lens size. When complete, select the **Return to Main** button

INTERSECTION CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD

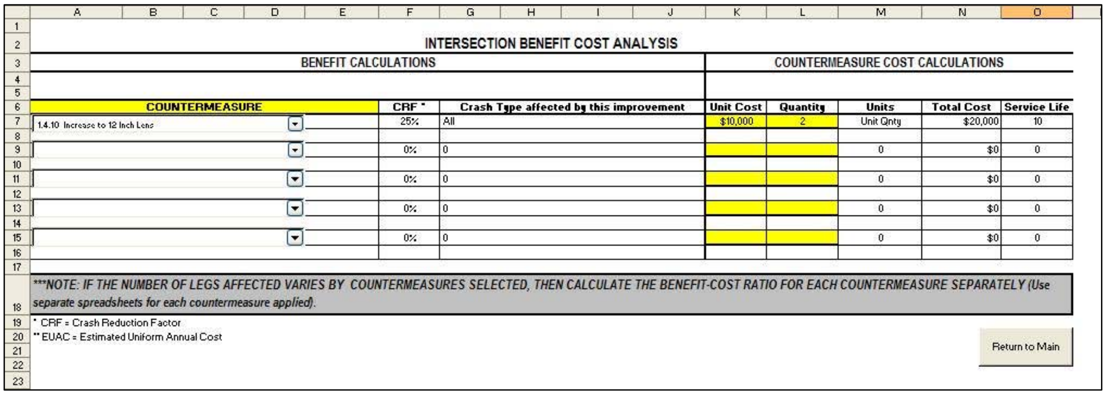
	Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overturned	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train
	AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	RT	SSD	SOD	T	TR
Fatal Crashes					1												
A-Injury Crashes	3				5							2				4	
B-Injury Crashes	6				10							3	1	1		7	
C-Injury Crashes																	
PDO Crashes																	

Return to Main



STEP 12: Select the button labeled **Countermeasure Selection**

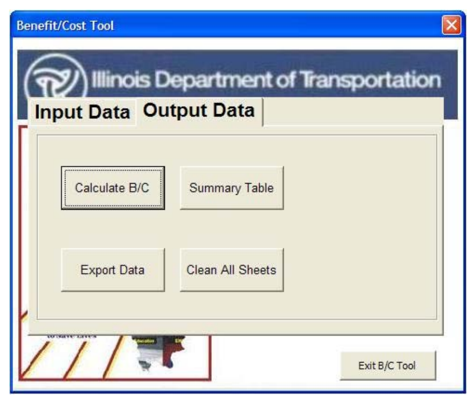
STEP 13: Select 1.4.10 Increase to 12 Inch Lens from the countermeasure dropdown menu.



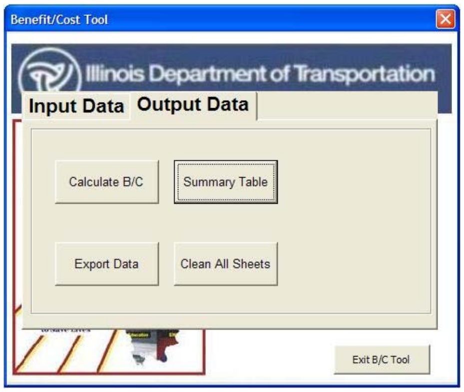
STEP 14: Enter the **Unit Cost** and **Quantity** for the selected countermeasure. The cost entered should be the cost for increasing the lens size on two legs of the intersection. When complete, select **Return to Main.**

When all input data has been completed, select the **Output Data** tab on the main menu and the screen shown below will appear.

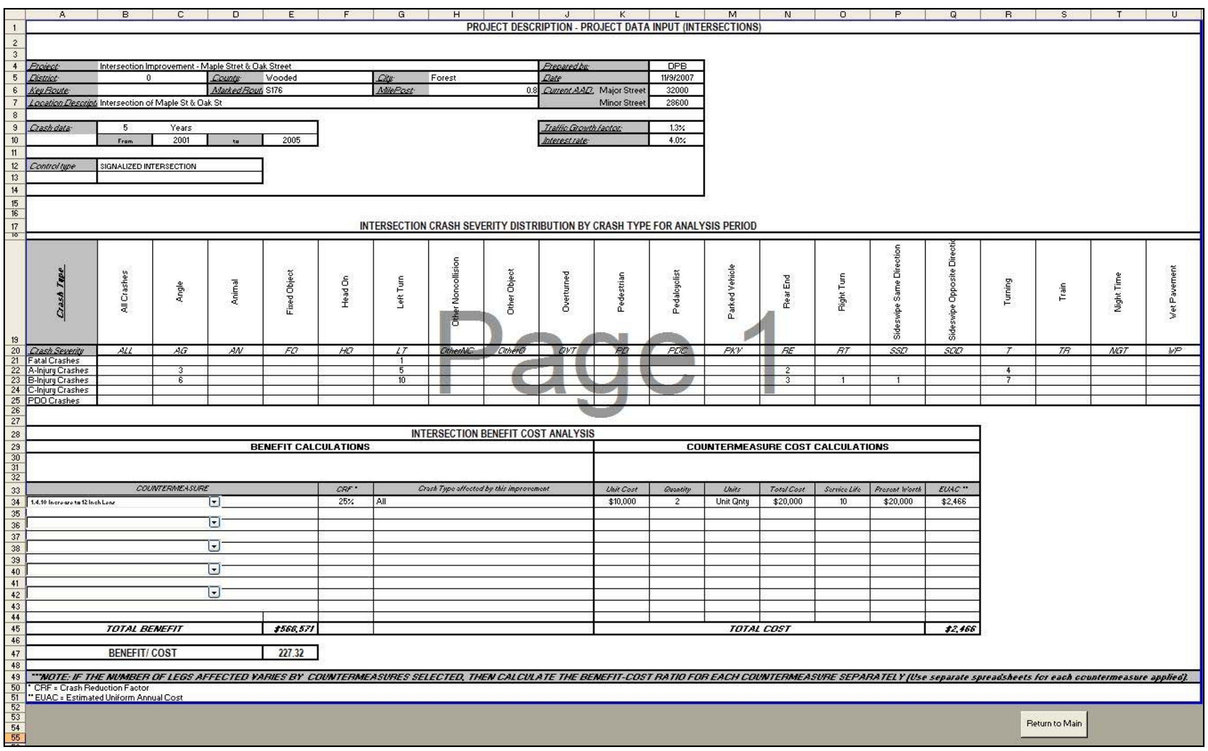
STEP 15: Click on the **Calculate B/C** button to obtain the benefit-cost ratio.



The image to the right will appear with the benefit /cost ratio for this project. Click the **OK** button to return to the main menu



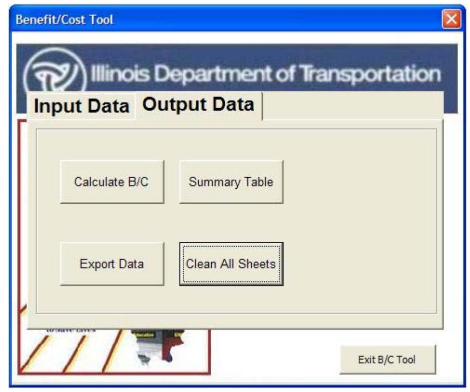
STEP 16: Select **Summary Table** to see a summary of the analysis or to verify inputs



The above window will appear when "Summary Table" is selected.

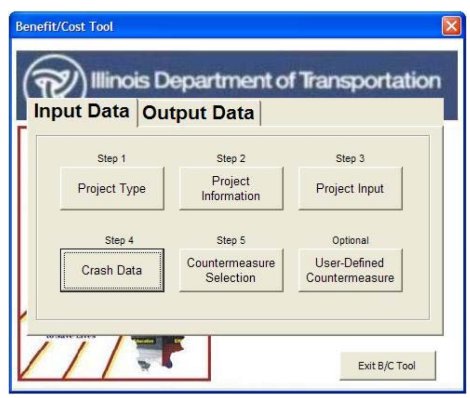
The analysis for treating two legs of the intersection with increasing the lens size is complete. To treat the other two legs of the intersection with an increase in lens size and the addition of left turn lanes and left turn phases, continue with the following steps.

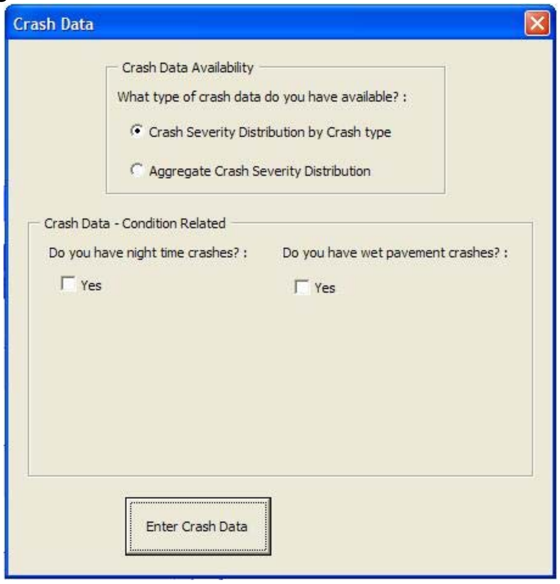
Step 17: The Project data has been already input into the menus, and the sheets. Click on the **Clean all Sheets** button to delete the input crash data to revise.



Step 18: Click **Yes** to confirm.

STEP 19: Select the button labeled **Crash Data**.





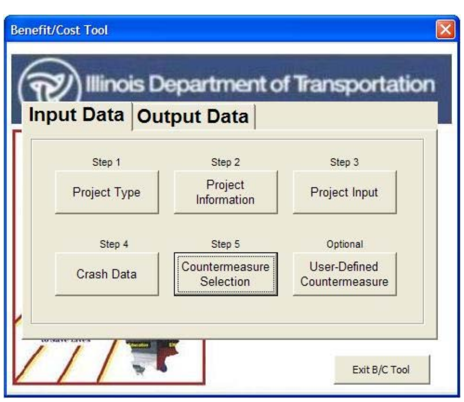
STEP 20: Select **Crash Severity Distribution by Crash Type** by clicking on the circle next to the text. When complete, select the **Enter Crash Data** button

STEP 21: Enter the crash data for the analysis period by crash type and severity for the crashes on the legs of the intersection that will be treated with increasing the lens size and the addition of the left turn lanes. Crashes should appear under one of the two B/C analyses, not both so that there is not double counting of crashes. When complete, select the **Return to Main** button.

INTERSECTION CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD

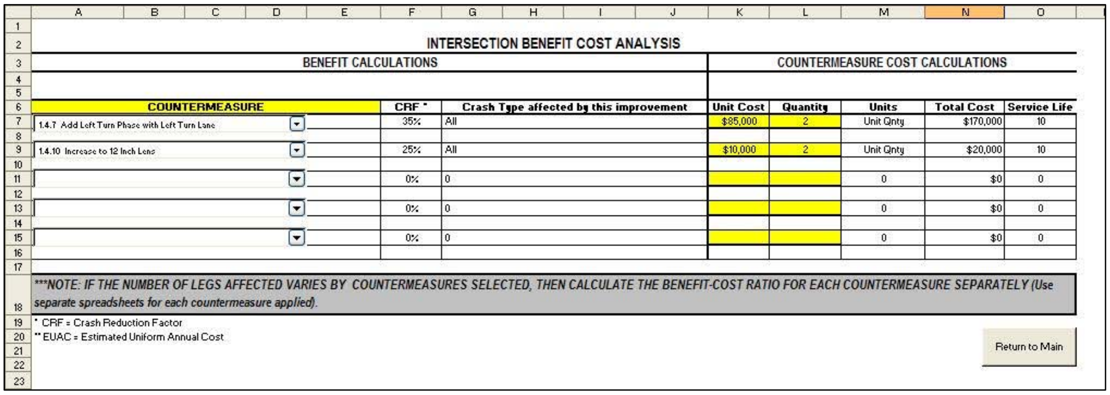
	Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overturned	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train
	AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	RT	SSD	SOD	T	TR
Fatal Crashes					1												
A-Injury Crashes	4				8							4				8	
B-Injury Crashes	7				15							1		2		10	
C-Injury Crashes																	
PDO Crashes																	

Return to Main



STEP 22: Select the button labeled **Countermeasure Selection.**

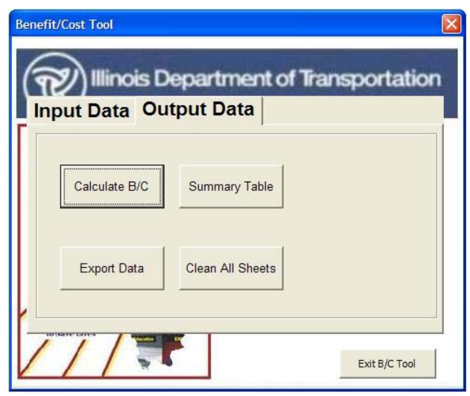
STEP 23: Select 1.4.7 Add Left Turn Phase with Left turn Lane, and 1.4.10 Increase to 12 Inch Lens from the countermeasure dropdown menu.



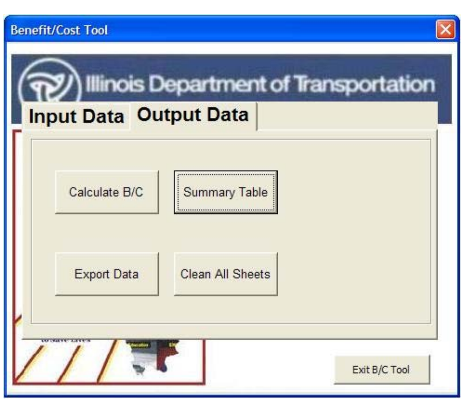
STEP 24: Enter the **Unit Cost** and **Quantity** for the selected countermeasures. When complete, select **Return to Main.**

STEP 25: When all input data has been completed, select the **Output Data** tab on the main menu and the screen shown below will appear.

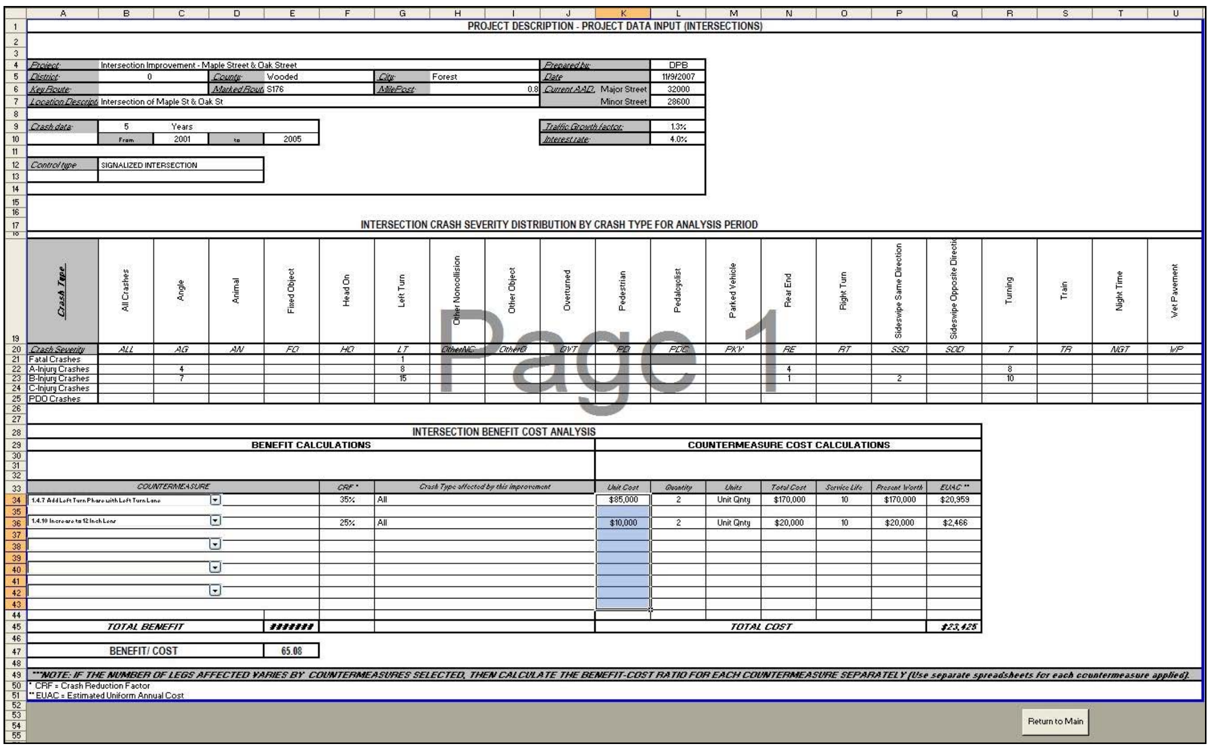
STEP 26: Click on the **Calculate B/C** button to obtain the benefit-cost ratio.



The image to the right will appear with the benefit /cost ratio for this project. Click the **OK** button to return to the main menu.



STEP 27: Select **Summary Table** to see a summary of the analysis or to verify inputs



The above window will appear when "Summary Table" is selected.

If you would like to save the run, select **Export Data.** This will allow you to save the file with a new name. The file can be opened at a later date and modified if necessary.

After completing the two benefit-cost analyses a, a combined b/c ratio can be obtained by adding the benefits and divided by the total cost. The total cost for this example is, $25,891 and the total benefit is $2,084,977.96. The composite B/C is 80.53.

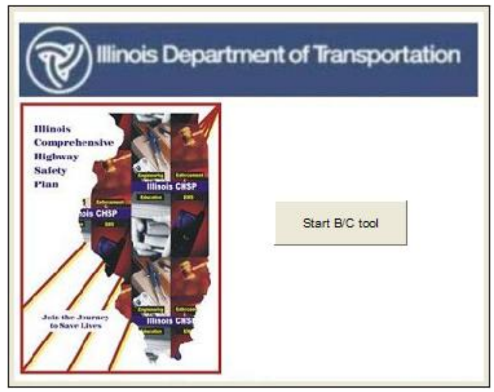
5.3 Case Study 3: Benefit Cost Analysis for a Systematic Improvement.

This case of study shows an analysis for systematic improvements at a series of locations that present similar type of risk or recurring number of crashes of certain type. The sites are located in District 10, and there are within 14 different counties' boundaries. A major crash pattern and risks at the different sites is associated with improvement and lack of warning signals.

This example reflects the step-by-step procedure for calculating the benefit-cost ratio for adding two types of warning signs and chevrons to the existing sites.

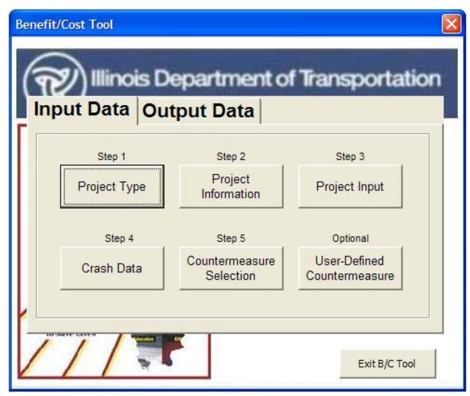
Step-by-Step Procedures

STEP 1: Start by pressing the **Start B/C Tool** button.



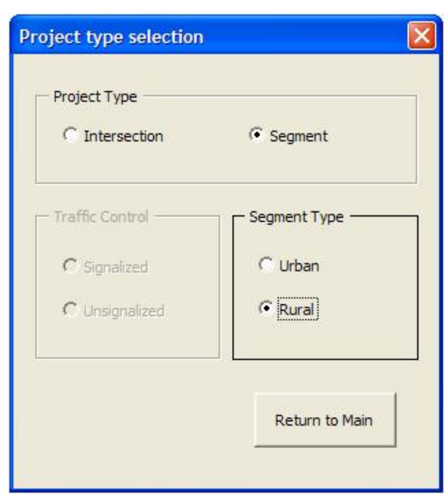
STEP 2: Select the **Input Data** tab.

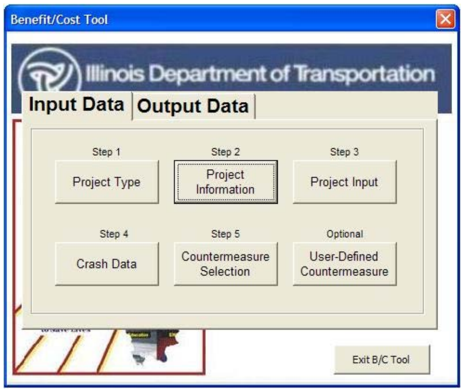
STEP 3: Select the button labeled **Project Type**



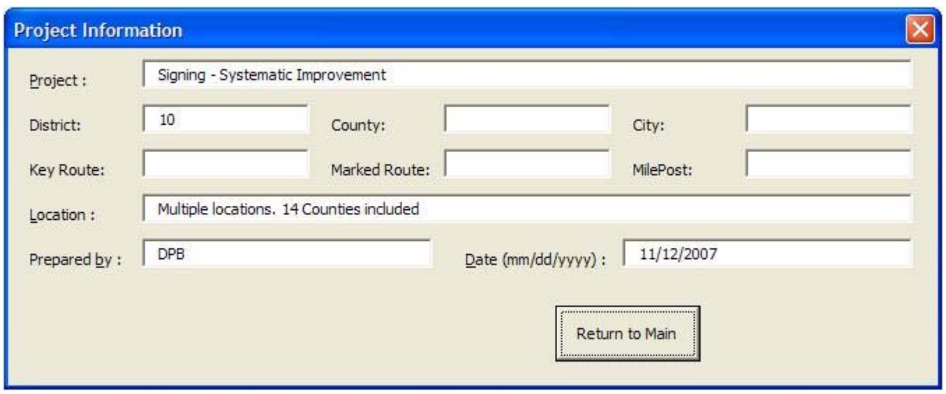
STEP 4: Select project type by clicking on the circle next to **Segment.** Select **Rural** under Segment Type.

When complete click on the **Return to Main** button to return to the main input window.



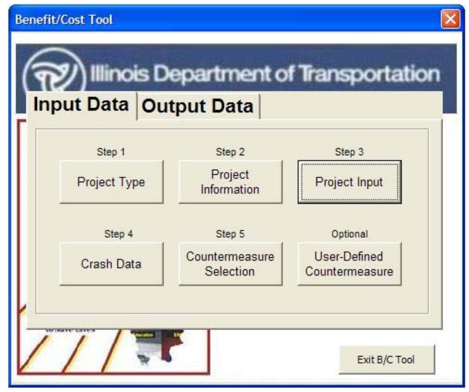


STEP 5: On the main menu, select the button labeled **Project Information**.

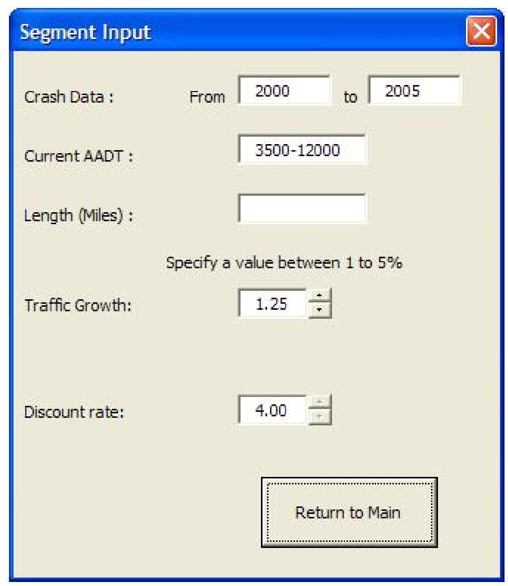


STEP 6: Complete the information in the boxes as shown. When all fields have been completed, click on **Return to Main**.

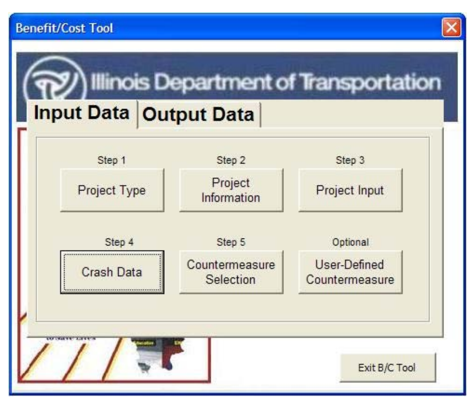
STEP 7: Select the button labeled **Project Input**.

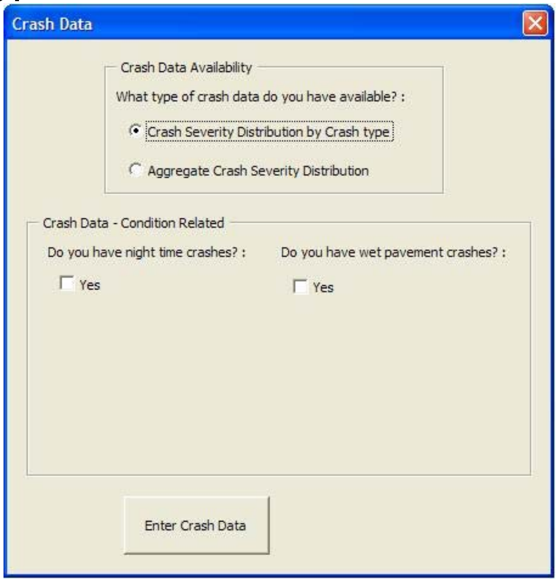


STEP 8: Input the information requested in the fields of the **Segment Input** window. When complete with all fields click on **Return to Main**.



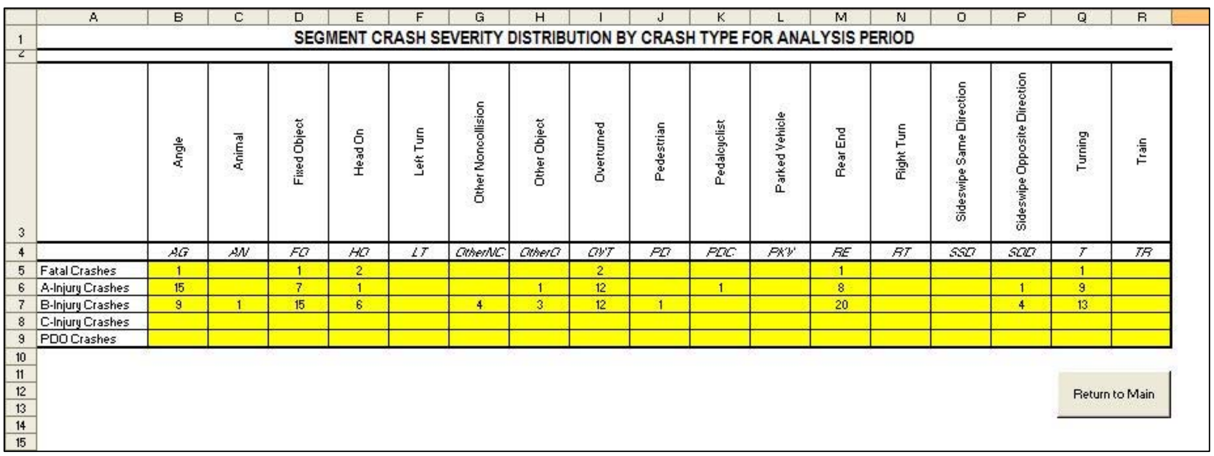
STEP 9: Select the button labeled **Crash Data**.





STEP 10: Select **Crash Severity Distribution by Crash Type** by clicking on the circle next to the text. When complete, select the **Enter Crash Data** button.

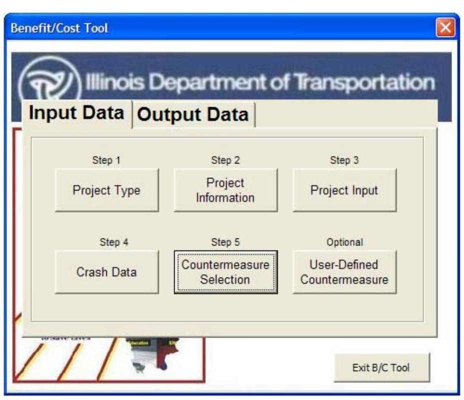
STEP 11: Enter the crash data for the analysis period by crash type and severity as shown. When complete, select the **Return to Main** button



SEGMENT CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD

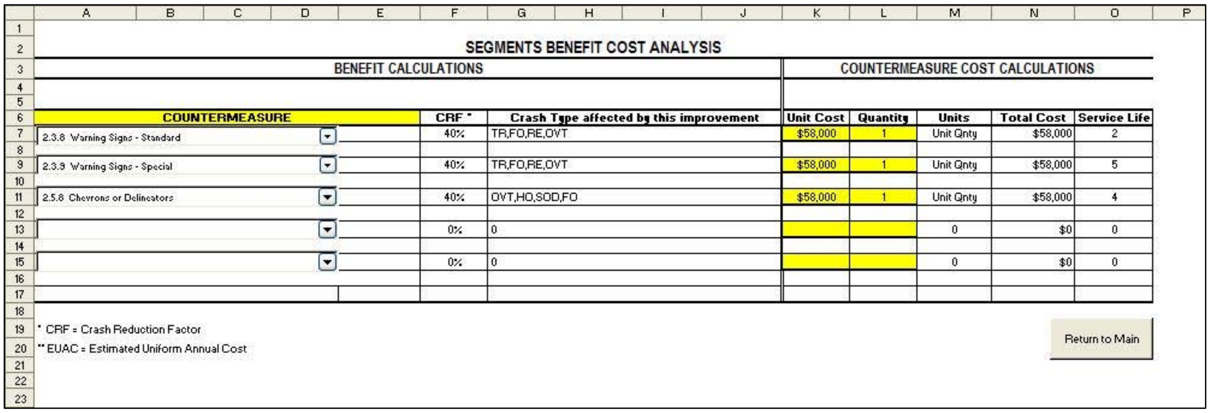
	Angle	Animal	Fixed Object	Head On	Left Turn	Other Noncollision	Other Object	Overturned	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train
	AG	AN	FO	HO	LT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	RT	SSD	SOD	T	TR
Fatal Crashes	1		1	2				2				1				1	
A-Injury Crashes	15		7	1			1	12		1		8			1	9	
B-Injury Crashes	9	1	15	6		4	3	12	1			20			4	13	
C-Injury Crashes																	
PDO Crashes																	

Return to Main



STEP 12: Select the button labeled **Countermeasure Selection**.

STEP 13: Select 2.3.8 Warning Signs – Standard, 2.3.9 Warning Signs – Special, and 2.5.8 Chevrons or Delineators from the countermeasure dropdown menu.



SEGMENTS BENEFIT COST ANALYSIS

BENEFIT CALCULATIONS			COUNTERMEASURE COST CALCULATIONS				
COUNTERMEASURE	CRF *	Crash Type affected by this improvement	Unit Cost	Quantity	Units	Total Cost	Service Life
2.3.8 Warning Signs - Standard	40%	TR,FO,RE,OVT	$58,000	1	Unit Qnty	$58,000	2
2.3.9 Warning Signs - Special	40%	TR,FO,RE,OVT	$58,000	1	Unit Qnty	$58,000	5
2.5.8 Chevrons or Delineators	40%	OVT,HO,SOD,FO	$58,000	1	Unit Qnty	$58,000	4
	0%	0			0	$0	0
	0%	0			0	$0	0

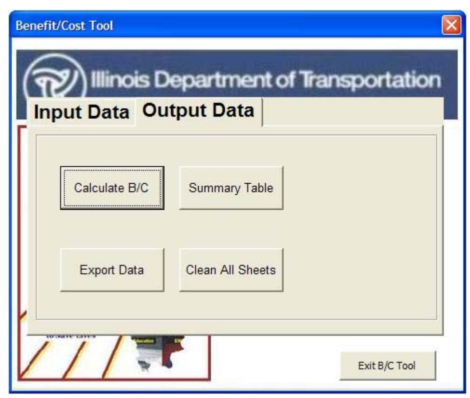
* CRF = Crash Reduction Factor
** EUAC = Estimated Uniform Annual Cost

Return to Main

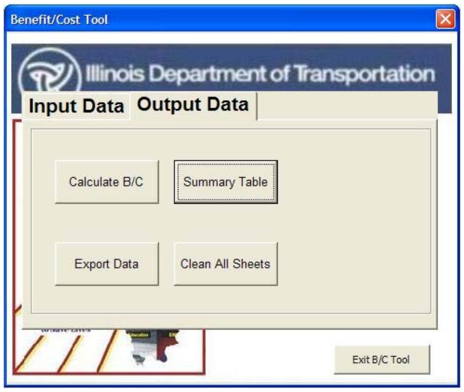
STEP 14: Enter the **Unit Cost** and **Quantity** for the selected countermeasure. When complete, select **Return to Main.**

When all input data has been completed, select the **Output Data** tab on the main menu and the screen shown below will appear.

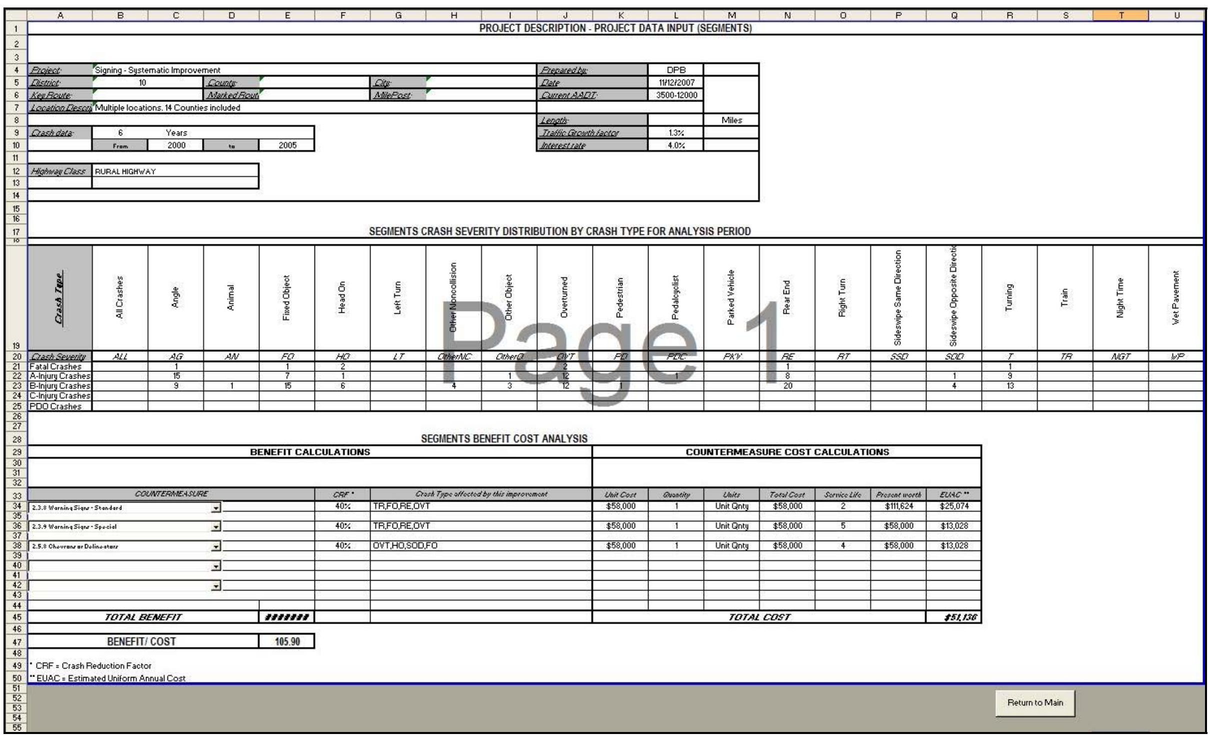
STEP 15: Click on the **Calculate B/C** button to obtain the benefit-cost ratio.



The image to the right will appear with the benefit /cost ratio for this project. Click the **OK** button to return to the main menu.



STEP 16: Select **Summary Table** to see a summary of the analysis or to verify inputs.



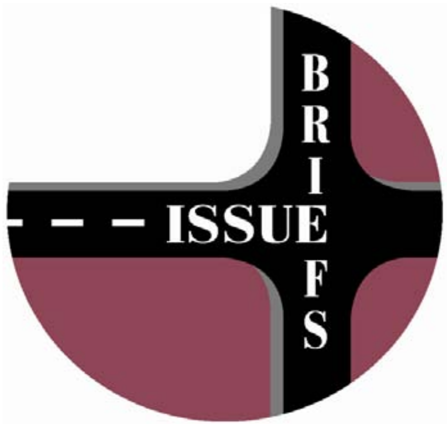
The above window will appear when "Summary Table" is selected.

If you would like to save the run, select **Export Data.** This will allow you to save the file with a new name. The file can be opened at a later date and modified if necessary.

HSIP Form Fields Conventions/Descriptions

FY:	Funding FY
Contract:	5 Digit
Award Date:	By BSE/BLRS
Completion Date:	By others
ID:	Assigned by BSE or BLRS – District/FY/Ordinal
District:	Number
County:	Name
Key Route:	IRIS Key Route Prefix and Number
Marked Route:	Map Marked Route
Route:	Local Route Name
Intersecting Roadway:	Include Key Route/Marked Route/Local Name as available
Length:	Miles (Intersection = 0.)
Mile Station:	IRIS Key Route Beg to End Milepost
Location Description:	Word Location Description. No need to repeat for intersection.
Rural/Urban:	Check one according to surrounding land use.
Lanes:	Number of through lanes on main road.
AADT (Segment):	AADT for most recent year available.
Total Entering AADT (Intersection):	Sum of AADT for most recent year available for all lanes entering the intersection.
Speed Limit:	Posted or regulatory speed limit(s). If more than one, describe limits in comments.
Friction Test Results:	Check and include report summary where used. Necessary for de-slick countermeasure.
Lighting Present:	Check if yes.
CHSP Emphasis Area:	From Illinois CHSP.
District Documentation:	If not in 5% map or intersection map, check here.
Systematic Improvements:	Use if making an area application of a countermeasure. (e.g. corridor guardrail upgrade)
Peer Group:	From Attachment
Other:	Note other attached documentation.
Crashes Details:	Self explanatory. Prefer at least 5 years' data.
Problem Description:	From review of crash records, crash reports, site visit, and other data list the engineering contributing factors to be addressed.
Previous Safety Improvements:	List any other work done previously and still in place to reduce crashes.
Collision Diagram:	Check if included as attachment.
Images:	Check if included in submittal.
Predominant Crash Types:	List, using types recorded in crash records.
Proposed Improvements:	List engineering countermeasures.
Estimated Project Cost:	Total cost in $000's that will include 90% HSIP funding.
Local Projects:	
Annual Fatal Crash Rate:	(Fatal crashes/length in miles) x 100
Annual A-Injury Crash Rate:	(A-injury crashes/length in miles) x 100
Local Roads Rural Functional Class:	Self explanatory.
Approved:	Safety Engineer Signature (By BSE)
Central HSIP Approval Date:	Signature Date (By BSE)
Funding:	Check appropriate HSIP/HRRR/RAIL
Comment:	As needed.
Distribution:	Will be completed by BSE.

Desktop Reference for Crash Reduction Factors

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U.S. Department of Transportation
Federal Highway Administration

September 2007

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Notice

Quality Assurance Statement

U.S. Department of Transportation
Federal Highway Administration

Technical Report Documentation Page

1. Report No.: FHWA-SA-07-015	2. Government Accession No.:	3. Recipient's Catalog No.:
4. Title and Subtitle *Desktop Reference for Crash Reduction Factors*		5. Report Date: September 2007 6. Performing Organization Code: iTRANS Consulting Ltd.
7. Authors: Bahar, Geni; Masliah, Maurice; Wolff, Rhys; Park, Peter		8. Performing Organization Report No.: 7067
9. Performing Organization Name and Address: iTRANS Consulting Ltd. 1220 L Street NW, #100-467 Washington, DC 2005-4018 (research) Vanasse Hangen Brustlin, Inc 8300 Boone Blvd., Ste. 700 Vienna, VA 22182-2626 (editorial)		10. Work Unit No.: 11. Contract or Grant No.: DTFH61-05-D-00024
12. Sponsoring Agency Name and Address: U.S. Department of Transportation Federal Highway Administration (FHWA) Office of Safety 1200 New Jersey Avenue, SE Washington, DC 20590		13. Type of Report and Period Covered: Information Guide Book January – September 2007 14. Sponsoring Agency Code: FHWA/HSA
15. Supplementary Notes: FHWA Office of Safety Contract Task Order Manager Dr. Clayton Chen (clayton.chen@dot.gov)		
16. Abstract. This Desktop Reference documents the estimates of the crash reduction that might be expected if a specific countermeasure or group of countermeasures is implemented with respect to intersections, roadway departure and other non-intersection crashes, and pedestrian crashes. The estimates of crash reduction are known as Crash Reduction Factors (CRFs), and represent the information available to date. Where available, the Desktop Reference includes multiple CRFs for the same countermeasure to allow the reader to review the range of potential effectiveness. The CRFs are a useful as a guide, but it remains necessary to apply engineering judgment and to consider site-specific environmental, traffic volume, traffic mix, geometric, and operational conditions which will affect the safety impact of a countermeasure.		
17. Key Words: crash reduction factor, CRF, intersection crashes, pedestrian crashes, roadway departure crashes	18. Distribution Statement: No restrictions. This document is available to the public through the National Technical Information Service, Springfield, VA 22161	
19. Security Classification (of this report): Unclassified	20. Security Classifications (of this page): Unclassified	21. No. of Pages: 113 / 22. Price

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U.S. Department of Transportation
Federal Highway Administration

Table of Contents

Desktop Reference for Crash Reduction Factors

Introduction

This Desktop Reference provides estimates of the crash reduction that might be expected if a specific countermeasure or group of countermeasures is implemented with respect to intersection crashes, roadway departure and other non-intersection crashes, and pedestrian crashes. The crash reduction estimates are known as Crash Reduction Factors (CRFs). The CRFs presented are the CRF information available to date. In some cases, the CRF is expressed as a Crash Reduction Function.

Where available, the Desktop Reference includes multiple CRFs for the same countermeasure to allow the reader to review the range of potential effectiveness. This Desktop Reference includes CRFs for which the reliability of the estimate is low, or very low. This approach is part of the philosophy of bringing together all the information available to date. (A few CRFs found in the literature were not included in the *Desktop Reference*. These CRFs were considered to have too large a range or too large a standard error to be meaningful, or the original research did not provide sufficient detail for the CRF to be useful.) The CRFs in this Desktop Reference may be periodically updated as new information becomes available.

Crash Reduction Factors

A CRF is the percentage crash reduction that might be expected after implementing a given countermeasure. (In some cases, the CRF is negative, i.e. the implementation of a countermeasure is expected to lead to a percentage increase in crashes.) *A CRF should be regarded as a generic estimate of the effectiveness of a countermeasure. The estimate is a useful guide, but it remains necessary to apply engineering judgment and to consider site-specific environmental, traffic volume, traffic mix, geometric, and operational conditions which will affect the safety impact of a countermeasure.* The user must ensure that a countermeasure applies to the particular conditions being considered. The reader is also encouraged to obtain and review the original source documents for more detailed information, and to search databases such as the National Transportation Library (ntlsearch.bts.gov) for information that becomes available after the publication of this Reference.

Traffic engineers and other transportation professionals can use the information contained in this issue brief when asking the following types of question: *Which countermeasures might be considered at the signalized intersection of Maple and Elm streets, an intersection experiencing a high number of total crashes and left-turn crashes? What change in the number of total crashes and left-turn crashes can be expected with the implementation of the various countermeasures?*

In the Tables presented in the Desktop Reference, CRFs are provided in the column “Crash Reduction Factor/Function.” The standard error of the CRF is given where available in the column “Std Error.” The standard error is the standard deviation of the error in the estimate of the CRF. The true value of the CRF is unknown. The standard error provides a measure of the precision of estimate of the true value of the CRF. A relatively small standard error indicates that a CRF is relatively precisely known. A relatively large standard error indicates that a CRF is not precisely known. The standard error may be used to estimate a confidence interval of the true value of the CRF. (An example of a confidence interval calculation is given below.)

As an example, the CRF for the countermeasure *install cameras to detect red-light running* for right-angle fatal/injury crashes is **16**. The following points should be noted:

- The CRF of 16 means that a 16% reduction in fatal/injury crashes is expected after the installation of red-light running cameras.
- This CRF is bolded which means that a) a rigorous study methodology was used to estimate the CRF, and b) the standard error is relatively small. A CRF which is not bolded indicates that a less rigorous methodology (e.g. a simple before-after study) was used to estimate the CRF, and/or the standard error is large compared with the CRF.
- The standard error for this CRF is 6. Using the standard error, it is possible to calculate the 95% confidence interval for the potential crash reduction that might be achieved by implementing the countermeasure. The 95% confidence interval is ±2 standard errors from the CRF. Therefore, the 95% confidence interval for the installation of red-light running cameras is between 4% and 28% (16 - 2×6 = 4%, and 16 + 2×6 = 28%).
- The reference number is 45 (Persaud et al., as listed in the References at the end of this Desktop Reference).

Crash Reduction Functions

In some cases, a CRF is given in the form of a function. As an example of a function, consider the countermeasure “Vary truck presence” at 4-leg signalized intersections on rural highways. This function is shown in Table 3. The study was conducted by Bonneson et al.

The function for “Vary truck presence” is:

$$CRF = 100\times[1-e^{(0.026\times(Pt-9))}]$$

Where Pt = percent trucks during the peak hour (average for all intersection movements)

The value of 9 in the function reflects the base condition: 9% trucks at 4-leg signalized intersections during the peak hour on rural highways (average for all intersection movements). If, for example, a practitioner wants to know the safety effect of decreasing the truck presence to 7%, then the resulting CRF value from the function would be 5 ($=100\times(1-e^{(0.026\times(7-9))})$). The CRF value of 5 suggests that crash frequency is reduced by about 5% for a 2 percentage point decrease in truck presence (from 9% to 7%).

Using the Tables

Twelve Tables of CRFs are provided in this Reference. The Tables are grouped under intersection, roadway departure, and pedestrian crashes, and summarize the information available. The Tables include as much information as is available for each CRF.

The Tables for intersection CRFs contain the following information (where available) for each countermeasure: crash type, crash severity, area type, configuration, control, major road daily traffic volume (vehicles/day), minor road daily traffic volume (vehicles/day), reference, number of intersections observed, crash reduction factor/function, standard error, range, and study type.

The Tables for roadway departure CRFs contain the following information (where available) for each countermeasure: crash type, crash severity, area type, road type, maximum daily traffic volume (vehicles/day), minimum daily traffic volume (vehicles/day), reference, crash reduction factor/function, standard error, range, and study type.

The Tables for pedestrian CRFs contain the following information (where available) for each countermeasure: crash type, crash severity, area type, reference, crash reduction factor/function, standard error, range, and study type.

The following points should be noted:

- The crash severities are: all, fatal/injury (fatal and injury crashes combined), fatal, injury, or property damage only (PDO).
- Where available, the Tables provide existing traffic control information (i.e. the conditions existing before implementation of a countermeasure). The control information for the pre-countermeasure study site may be “no signal,” “signal,” “stop,” or “stop/yield.” “No signal” is used when a publication specifies that the intersection was not signalized before the countermeasure was introduced, but does not provide details. (In these cases, the intersection could have yield or stop signs, or no controls at all.) Where the original study is not clear, or omits to give the information, the cell is left blank.
- Road type information (for roadway departure countermeasures) uses the following road types (where available): all, multilane, multilane divided, arterial, highway, or freeway. Where the original study was not clear, or omitted to give the information, the cell is left blank or the study’s wording is used.
- In the observed column, a higher number of intersections/sites usually corresponds with a more reliable estimate of the safety effectiveness.

- For some countermeasures, a range of safety effectiveness is provided in the Range Low and Range High columns.
- The study type refers to the methodology used in the CRF study.
- A blank cell means that no information is reported in the source document.
- The following abbreviations appear in the Tables:
  - App = Approaches
  - Avg = Average
  - Config = Configuration
  - EB = Empirical Bayes
  - Emerg = Emergency
  - Max = Maximum
  - Min = Minimum
  - Obs = Number of observed intersections
  - PDO = Property Damage Only
  - Ped = Pedestrian
  - Ref = Reference
  - ROR = Run-Off-Road
  - Std Error = Standard Error

- For additional information, please visit the FHWA Office of Safety website safety.fhwa.dot.gov.

Tables for Intersection Crash Reduction Factors

U.S. Department of Transportation
Federal Highway Administration

Table 1: Signalization Countermeasures

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major Daily Traffic Volume (veh/day)	Minor Daily Traffic Volume (veh/day)	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
SIGNAL OPERATIONS COUNTERMEASURES														
Add all-red clearance interval	All	All			Signal			15		15				Cross-section
	Right-angle	All			Signal			15		30				Cross-section
Add all-red clearance interval (from 0 to 1 second)	Right-angle	All	Urban		Signal			47	6	0	44	-32	67	
Add exclusive pedestrian phasing	Ped	All			Signal			28		34		7	60	
Convert exclusive leading protected to exclusive lagging protected	All	All			Signal			25		-15	19			Simple Before-After
	Left-turn	All			Signal			25		-49	54			Simple Before-After
Convert protected left-turn phase to protected/permissive	All	All			Signal			25		-20	17			Comparison Group Before-After
	All	Fatal/Injury			Signal			25		-10	25			Comparison Group Before-After
	Left-turn	All			Signal			25		-65	71			Comparison Group Before-After
	Rear-end	All			Signal			25		4	22			Comparison Group Before-After
Convert protected/permissive left-turn phase to permissive/protected	All	All			Signal			29		13	19			Simple Before-After
	Left-turn	All			Signal			29		33	22			Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major Daily Traffic Volume (veh/day)	Minor Daily Traffic Volume (veh/day)	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Improve signal timing [to intervals specified by the ITE *Determining Vehicle Change Intervals: A Proposed Recommended Practice* (1985)]	All	All		4-Leg	Signal			49		**8**	9			Experimental Design (Case-Control Study)
	All	All		4-Leg	Signal			39	20	18				
	All	Fatal/Injury		4-Leg	Signal			49		12	9			Experimental Design (Case-Control Study)
	Head-on	Fatal/Injury			Signal			15		75				Simple Before-After
	Left-turn	All			Signal			15		75				
	Left-turn	Fatal/Injury			Signal			15		55				Simple Before-After
	Left-turn	PDO			Signal			15		63				Simple Before-After
	Multi-vehicle	All	All		Signal			21	40	5				Comparison Group Before-After
	Multi-vehicle	Fatal/Injury	All		Signal			21	40	9				Comparison Group Before-After
	ROR	Fatal/Injury			Signal			15		62				Simple Before-After
	ROR	PDO			Signal			15		28				Simple Before-After
	Older-driver	All		4-Leg	Signal			39	20	42				
	Rear-end	All		4-Leg	Signal			49		-12	16			Experimental Design (Case-Control Study)

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day) Major	Daily Traffic Volume (veh/day) Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Improve signal timing [to intervals specified by the ITE *Determining Vehicle Change Intervals: A Proposed Recommended Practice* (1985)] (cont'd)	Rear-end	Fatal/Injury		4-Leg	Signal			49		-8	17			Experimental Design (Case-Control Study)
	Rear-end	PDO			Signal			15		17				Simple Before-After
	Right-angle	All		4-Leg	Signal			49		4	18			Experimental Design (Case-Control Study)
	Right-angle	Fatal/Injury			Signal			15		30				Simple Before-After
	Right-angle	Fatal/Injury		4-Leg	Signal			49		-6	22			Experimental Design (Case-Control Study)
	Right-angle	PDO			Signal			15		46				Simple Before-After
	Ped	Fatal/Injury			Signal			49		37				Comparison Group Before-After
Increase yellow change interval	All	All			Signal			15		15				Cross-section
	Right-angle	All			Signal			15		30				Cross-section
Install emergency vehicle pre-emption systems	Emerg vehicle	All						51		70				
Install pedestrian countdown signal heads	Ped	Fatal/Injury	Urban (San Francisco)		Signal			32		25				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major	Minor	Ref	Obs	Effectiveness				Study Type
						Daily Traffic Volume (veh/day)				Crash Reduction Factor / Function	Std Error	Range Low	Range High	
Install pedestrian signal	All	All			Signal			15		20				
	All	All						15		25				
	All	All						15		15				
	Ped	All			Signal			15		53				
	Ped	All			Signal			5		0				
	Ped	All						15		55				
	Ped	All						15		50				
Modify signal phasing (implement a leading pedestrian interval)	Ped	All			Signal			28		5				
Provide actuated signals	Left-turn	All			Signal			15		80				Cross-section
	Right-angle	All			Signal			15		10				Cross-section
Provide Advanced Dilemma Zone Detection for rural high speed approaches	All	Fatal/Injury	Rural	4-Leg (1 app)	Signal			61	5	39				Simple Before-After
Provide protected left-turn phase	All	All			Signal	<5,000/lane(Total)		15		30				Simple Before-After
	All	All			Signal	>5,000/lane(Total)		15		36				Simple Before-After
	All	All			Signal			15		15				Simple Before-After
	All	All			Signal			15		25				Cross-section
	All	All			Signal			15		30				Simple Before-After
	All	All			Signal			15		27				
	Left-turn	All			Signal	<5,000/lane(Total)		15		41				Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major Daily Traffic Volume (veh/day)	Minor Daily Traffic Volume (veh/day)	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
Provide protected left-turn phase (cont'd)	Left-turn	All			Signal	>5,000/lane(Total)		15		46				Simple Before-After
	Left-turn	All			Signal			15		35				Simple Before-After
	Left-turn	All			Signal			15		70				Cross-section
	Left-turn	All			Signal			15		48				
	Left-turn	Fatal/Injury	Urban		Signal			31	30	**16**	2			EB Before-After
	Right-angle	Fatal/Injury	Urban		Signal			31	30	**19**	2			EB Before-After
	Overturn	All			Signal	<5,000/lane(Total)		15		27				Simple Before-After
	Overturn	All			Signal	>5,000/lane(Total)		15		35				Simple Before-After
	Overturn	All			Signal			15		31				
	Ped	All			Signal			28		5				
	Rear-end	All			Signal	<5,000/lane(Total)		15		27				Simple Before-After
	Rear-end	All			Signal	>5,000/lane(Total)		15		35				Simple Before-After
	Rear-end	All			Signal			15		31				
	Right-angle	All			Signal	<5,000/lane(Total)		15		54				Simple Before-After
	Right-angle	All			Signal	>5,000/lane(Total)		15		56				Simple Before-After
	Right-angle	All			Signal			15		80				Simple Before-After
	Right-angle	All			Signal			15		63				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day) Major	Daily Traffic Volume (veh/day) Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Provide protected/permissive left-turn phase (leading flashing green) (Request MUTCD Experimentation)	Left-turn	Fatal/Injury	Urban		Signal			31	15	**16**	4			EB Before-After
	Right-angle	Fatal/Injury	Urban		Signal			31	15	**12**	4			EB Before-After
Provide protected left-turn phase (leading green arrow)	Left-turn	Fatal/Injury	Urban		Signal			31	20	**17**	2			EB Before-After
	Right-angle	Fatal/Injury	Urban		Signal			31	20	**25**	2			EB Before-After
Provide signal coordination	All	All	All		Signal			1		15				
	All	All			Signal			28		16				
	All	All	Arizona		Signal			3		7				
	Right-angle	All			Signal			28		32		25	38	
Provide split phases	All	All			Signal			28		25				
Remove flash mode (late night/early morning)	All	All			Signal			28		29				
	Right-angle	All			Signal			47	17	75	19	29	100	Simple Before-After
	Right-angle	All			Signal			28		80				
SIGNAL HARDWARE COUNTERMEASURES														
Add 3-inch yellow retroreflective sheeting to signal backplates	All	All	Urban		Signal			54		15	51			EB Before-After
Add additional signal and upgrade to 12-inch lenses	Older-driver	All		4-Leg	Signal			39	33	31				
	Younger-driver	All		4-Leg	Signal			39	33	17				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major Daily Traffic Volume (veh/day)	Minor Daily Traffic Volume (veh/day)	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
Add signal (additional primary head)	All	All			Signal			28		10				
	All	All	Urban	4-Leg	Signal			14	63	28		20	30	EB Before-After
	All	Fatal/Injury	Urban	4-Leg	Signal			14	63	17		10	25	EB Before-After
	All	PDO	Urban	4-Leg	Signal			14	63	31		30	35	EB Before-After
	Rear-end	All	Urban	4-Leg	Signal			14	63	28		0	45	EB Before-After
	Right-angle	All			Signal			28		42				
	Right-angle	All	Urban	4-Leg	Signal			14	63	35		15	45	EB Before-After
Convert signal from pedestal-mounted to mast arm	All	All			Signal			51		49				
	All	All			Signal			35	6	25				Simple Before-After
	All	All			Signal			35	33	32				Simple Before-After
	All	All			Signal			28		36		28	43	
	All	Fatal/Injury			Signal			51		44				
	All	PDO			Signal			51		51				
	Left-turn	All			Signal			51		12				
	Rear-end	All			Signal			51		41				
	Right-angle	All			Signal			51		74				
	Right-angle	All			Signal			35	6	63				Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day)		Ref	Obs	Effectiveness				Study Type
						Major	Minor			Crash Reduction Factor / Function	Std Error	Range		
												Low	High	
Improve visibility of signal heads (increase signal lens size, install new backboards, add reflective tape to existing backboards, and/or install additional signal heads)	All	All	Urban		Signal			52	224	7				EB Before-After
	All	Fatal/Injury	Urban		Signal			52	224	3				EB Before-After
	All	PDO	Urban		Signal			52	224	9				EB Before-After
	Day	All	Urban		Signal			52	224	6				EB Before-After
	Night	All	Urban		Signal			52	224	6				EB Before-After
Improve visibility of signal heads (install two red displays in each head)	All	All			Signal			28		9				
	Right-angle	All			Signal			28		36				
Install larger signal lenses (12 inch)	All	All	All		Signal			1		10				
	All	All			Signal			28		11				
	All	All			Signal			15		10				
	All	All			Signal			15		10				Cross-section
	All	All			Signal			28		11		10	12	
	All	All	Urban		Signal			54		24				Cross-section
	All	Fatal/Injury	Urban		Signal			54		16				Cross-section
	Right-angle	All			Signal			47	44	46		-89	100	Simple Before-After
	Right-angle	All			Signal			28		48				
Install signal backplates only	All	All			Signal			28		13		2	24	
	Right-angle	All			Signal			28		50		7	93	
Install signal backplates (or visors)	Right-angle	All			Signal			15		20				
	Right-angle	All			Signal			15		20				Cross-section

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major Daily Traffic Volume (veh/day)	Minor Daily Traffic Volume (veh/day)	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Install signals	All	All			No signal	<5,000/lane(Total)		15		38				Simple Before-After
	All	All			No signal	>5,000/lane(Total)		15		20				Simple Before-After
	All	All			No signal			28		33		20	45	
	Left-turn	All			No signal			43	447	38				Simple Before-After
	Right-turn	All			No signal			43	447	50				Simple Before-After
	All	All	Rural		No signal			43	447	15				Simple Before-After
	All	Fatal			No signal			43	447	38				Simple Before-After
	Rear-end	All			No signal			43	447	-48				Simple Before-After
	Right-angle	All			No signal			43	447	29				Simple Before-After
	All	All	Urban		No signal			43	447	17				Simple Before-After
	All	All			No signal			15		22				
	All	All			No signal			15		15				Simple Before-After
	All	All			No signal			15		13				Simple Before-After
	All	All			No signal			15		20				Simple Before-After
	All	All			No signal			15		25				Cross-section
	All	All			No signal			15		20				Simple Before-After
	All	Fatal/Injury	Urban	3-Leg	Stop	11,750-42,000	900-4,000	34		14	32			EB Before-After
	All	Fatal/Injury	Urban	4-Leg	Stop	12,650-22,400	2,400-3,625	34		23	22			EB Before-After
	Overturn	All			No signal	<5,000/lane(Total)		15		22				Simple Before-After
	Overturn	All			No signal	>5,000/lane(Total)		15		20				Simple Before-After
	Rear-end	All			No signal	<5,000/lane(Total)		15		22				Simple Before-After
	Rear-end	All			No signal	>5,000/lane(Total)		15		20				Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major Daily Traffic Volume (veh/day)	Minor Daily Traffic Volume (veh/day)	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
Install signals (cont'd)	Rear-end	Fatal/Injury	Urban	3-Leg	Stop	11,750-42,000	900-4,000	34		-50	51			EB Before-After
	Rear-end	Fatal/Injury	Urban	4-Leg	Stop	12,650-22,400	2,400-3,625	34		-38	39			EB Before-After
	Right-angle	All			No signal	<5,000/lane(Total)		15		74				Simple Before-After
	Right-angle	All			No signal	>5,000/lane(Total)		15		43				Simple Before-After
	Right-angle	All			No signal			15		58				
	Right-angle	All			No signal			15		60				Simple Before-After
	Right-angle	All			No signal			15		42				Simple Before-After
	Right-angle	All			No signal			15		65				Cross-section
	Right-angle	All			No signal			15		65				Simple Before-After
	Right-angle	All			No signal			28		68				
	Right-angle	All			No signal			47	8	74	66	56	100	Simple Before-After
	Right-angle	Fatal/Injury	Urban	3-Leg	Stop	11,750-42,000	900-4,000	34		34	45			EB Before-After
	Right-angle	Fatal/Injury	Urban	4-Leg	Stop	12,650-22,400	2,400-3,625	34		**67**	20			EB Before-After
	All	PDO			No signal			43	447	-15				Simple Before-After
Install signals (temporary)	Head-on	PDO			No signal			15		83				Simple Before-After
	Left-turn	PDO			No signal			15		11				Simple Before-After
	Right-angle	Fatal/Injury			No signal			15		39				Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major	Minor	Ref	Obs	Effectiveness				Study Type
						Daily Traffic Volume (veh/day)				Crash Reduction Factor / Function	Std Error	Range		
												Low	High	
Install signals (temporary) (cont'd)	Right-angle	PDO			No signal			15		73				Simple Before-After
	Sideswipe	Fatal/Injury			No signal			15		50				Simple Before-After
Install signals (to have one over each approach lane)	Right-angle	All	All					35		46				Simple Before-After
Remove unwarranted signals	All	All			Signal			15		75				
	All	All			Signal			15		100				Simple Before-After
	All	All			Signal			15		50				Cross-section
	All	All			Signal			15		75				Simple Before-After
	All	All			Signal			28		52		50	53	
	All	All	Urban		Signal			21	199	24				EB Before-After
	All	Fatal/Injury	Urban		Signal			21	199	53				EB Before-After
	All	PDO	Urban		Signal			21	199	24				EB Before-After
	Day	All	Urban		Signal			21	199	22				EB Before-After
	Fixed-object	All	Urban		Signal			21	199	31				EB Before-After
	Night	All	Urban		Signal			21	199	30				EB Before-After
	Rear-end	All			Signal			15		95		90	100	
	Rear-end	All			Signal			15		100				Simple Before-After
	Rear-end	All			Signal			15		90				Cross-section
	Rear-end	All	Urban		Signal			21	199	29				EB Before-After
	Right-angle	All	Urban		Signal			21	199	24				EB Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day)		Ref	Obs	Effectiveness				Study Type
						Major	Minor			Crash Reduction Factor / Function	Std Error	Range Low	Range High	
Replace signal lenses with optical lenses	All	All			Signal			28		17		15	18	
	All	All			Signal			15		15				
	All	All			Signal			15		15				Cross-section
	Head-on	All			Signal			15		20				Cross-section
	Left-turn	All			Signal			15		10				Cross-section
	Rear-end	All			Signal			15		10				Cross-section
	Right-angle	All			Signal			15		10				Cross-section
COMBINATION SIGNAL AND OTHER COUNTERMEASURES														
Install left-turn lane and add turn phase	All	All			Signal			28		58		46	69	
Install signals and add channelization	Head-on	PDO			No signal			15		27				Simple Before-After
	Left-turn	PDO			No signal			15		24				Simple Before-After
	ROR	Fatal/Injury			No signal			15		35				Simple Before-After
	Right-angle	Fatal/Injury			No signal			15		67				Simple Before-After
	Right-angle	PDO			No signal			15		63				Simple Before-After
	Sideswipe	Fatal/Injury			No signal			15		54				Simple Before-After

Table 2: Geometric Countermeasures

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major Daily Traffic Volume (veh/day)	Minor Daily Traffic Volume (veh/day)	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
LEFT-TURN COUNTERMEASURES														
Add indirect left-turn treatments to minimize conflicts	All	All			Stop	>34,000		59		18	8			Cross-section
	All	All			Stop	>34,000 4 lanes		59		-24	35			Cross-section
	All	All			Stop	>34,000 6 lanes		59		26	8			Cross-section
	All	All			Stop	>34,000 8 lanes		59		24	63			Cross-section
	All	Fatal/Injury			Stop	>34,000		59		27	12			Cross-section
	All	PDO			Stop	>34,000		59		6	11			Cross-section
Create directional median openings to allow left-turns and u-turns	All	All			Signal			51		51				
Install left-turn lane	All	All	All					1		25				
	All	All	Rural	3-Leg	Signal	4,200-26,000	1,300-11,400	22	199	15				Expert Panel
	All	All	Rural	3-Leg	Stop	1,100-32,400	25-11,800	22		**44**	6			EB Before-After
	All	All	Rural	4-Leg (1 app)	Signal	4,200-26,000	1,300-11,400	22	199	18				Expert Panel
	All	All	Rural	4-Leg (1 app)	Stop	1,100-32,400	25-11,800	22		**28**	3			EB Before-After
	All	All	Rural	4-Leg (2 app)	Stop	1,100-32,400	25-11,800	22		**48**	3			EB Before-After
	All	All			No signal			15		34				
	All	All			No signal			15		35				Simple Before-After
	All	All			No signal			15		35				Cross-section
	All	All			No signal			15		25				Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major Daily Traffic Volume (veh/day)	Minor Daily Traffic Volume (veh/day)	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Install left-turn lane (cont'd)	All	All			No signal			15		40				Simple Before-After
	All	All			No signal			28		33		25	41	
	All	All	Urban	3-Leg	Signal	4,600-55,100	100-26,000	22	199	7				Expert Panel
	All	All	Urban	3-Leg	Stop	1,520-40,600	80-8,000	22		**33**	12			EB Before-After
	All	All	Urban	4-Leg (1 app)	Signal	4,600-55,100	100-26,000	22		**10**	10			EB Before-After
	All	All	Urban	4-Leg (1 app)	Stop	1,520-40,600	80-8,000	22		**27**	3			EB Before-After
	All	All	Urban	4-Leg (2 app)	Signal	4,600-55,100	100-26,000	22		19	13			EB Before-After
	All	All	Urban	4-Leg (2 app)	Stop	1,520-40,600	80-8,000	22		**47**	4			EB Before-After
	All	Fatal/Injury	Rural	3-Leg	Stop	1,100-32,400	25-11,800	22		**55**	8			EB Before-After
	All	Fatal/Injury	Rural	4-Leg (1 app)	Stop	1,100-32,400	25-11,800	22		**35**	3			EB Before-After
	All	Fatal/Injury	Rural	4-Leg (2 app)	Stop	1,100-32,400	25-11,800	22		**58**	4			EB Before-After
	All	Fatal/Injury	Urban	4-Leg (1 app)	Signal	4,600-55,100	100-26,000	22		**9**	1			EB Before-After
	All	Fatal/Injury	Urban	4-Leg (1 app)	Stop	1,520-40,600	80-8,000	22		**29**	4			EB Before-After
	All	Fatal/Injury	Urban	4-Leg (2 app)	Signal	4,600-55,100	100-26,000	22		**17**	2			EB Before-After
	All	Fatal/Injury	Urban	4-Leg (2 app)	Stop	1,520-40,600	80-8,000	22		50	6			Comparison Group
	All	Fatal/Injury	All	All	All			58		30				
	Left-turn	All	Rural	3-Leg	Stop	1,100-32,400	25-11,800	21	35	62				Comparison Group Before-After
	Left-turn	All	Rural	4-Leg (1 app)	Stop	1,100-32,400	25-11,800	21	23	37				EB Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major Daily Traffic Volume (veh/day)	Minor Daily Traffic Volume (veh/day)	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
Install left-turn lane (cont'd)	Left-turn	All	Rural	4-Leg (2 app)	Stop	1,100-32,400	25-11,800	21	23	60				EB Before-After
	Left-turn	All			No signal			15		55				
	Left-turn	All			No signal			15		55				Simple Before-After
	Left-turn	All			No signal			28		68		50	86	
	Left-turn	All			Signal	>5,000/lane(Total)		15		24				Simple Before-After
	Left-turn	All	Urban	4-Leg (1 app)	Signal	4,600-55,100	100-26,000	21	35	13				Yorked Comparison Before-After
	Left-turn	All	Urban	4-Leg (1 app)	Stop	1,520-40,600	80-8,000	21	7	26				EB Before-After
	Left-turn	All	Urban	4-Leg (2 app)	Signal	4,600-55,100	100-26,000	21	35	24				Yorked Comparison Before-After
	Left-turn	All	Urban	4-Leg (2 app)	Stop	1,520-40,600	80-8,000	21	7	45				EB Before-After
	Night	All			Signal	>5,000/lane(Total)		15		28				Simple Before-After
	Overturn	All			Signal	>5,000/lane(Total)		15		28				Simple Before-After
Install left-turn lane (double)	Head-on	Fatal/Injury						15		75				Simple Before-After
	Left-turn	Fatal/Injury						15		47				Simple Before-After
	Left-turn	PDO						15		71				Simple Before-After
	ROR	Fatal/Injury						15		8				Simple Before-After
	ROR	PDO						15		13				Simple Before-After
	Rear-end	Fatal/Injury						15		29				Simple Before-After
	Rear-end	PDO						15		32				Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day): Major	Daily Traffic Volume (veh/day): Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Install left-turn lane (double) (cont'd)	Right-angle	Fatal/Injury						15		20				Simple Before-After
	Right-angle	PDO						15		8				Simple Before-After
	Sideswipe	Fatal/Injury						15		50				Simple Before-After
Install left-turn lane (painted separation)	All	All				<5,000/lane(Total)		15		50				Simple Before-After
	All	Fatal/Injury	Rural	3-Leg		5,000-15,000		13		22	14			Meta-analysis
	All	Fatal/Injury	Rural	4-Leg		5,000-15,000		13		-28	27			Meta-analysis
	All	PDO	Rural	3-Leg		5,000-15,000		13		20	19			Meta-analysis
	All	PDO	Rural	4-Leg		5,000-15,000		13		26	12			Meta-analysis
	Left-turn	All				<5,000/lane(Total)		15		57				Simple Before-After
	Left-turn	All				>5,000/lane(Total)		15		35				Simple Before-After
	Overturn	All				<5,000/lane(Total)		15		54				Simple Before-After
	Overturn	All				>5,000/lane(Total)		15		39				Simple Before-After
	Rear-end	All				<5,000/lane(Total)		15		54				Simple Before-After
	Rear-end	All				>5,000/lane(Total)		15		39				Simple Before-After
	Right-angle	All				<5,000/lane(Total)		15		62				Simple Before-After
	Right-angle	All				>5,000/lane(Total)		15		49				Simple Before-After
Install left-turn lane (physical channelization)	All	All	All		No signal			1		35				
	All	All	All		Signal			1		25				
	All	All	Rural	3-Leg	No signal			28		44				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day): Major	Daily Traffic Volume (veh/day): Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Install left-turn lane (physical channelization) (cont'd)	All	All	Rural	4-Leg (1 app)	No signal			28		28				
	All	All		4-Leg (2 app)	No signal			28		42				
	All	All				<5,000/lane(Total)		15		51				Simple Before-After
	All	All				>5,000/lane(Total)		15		19				Simple Before-After
	All	All	Urban	3-Leg	No signal			28		33				
	All	All	Urban	4-Leg (1 app)	No signal			28		27				
	All	Fatal/Injury	Rural	3-Leg		5,000-15,000		13		27	13			Meta-analysis
	All	Fatal/Injury	Rural	4-Leg		5,000-15,000		13		4	12			Meta-analysis
	All	PDO	Rural	3-Leg		5,000-15,000		13		-20	23			Meta-analysis
	All	PDO	Rural	4-Leg		5,000-15,000		13		16	22			Meta-analysis
	Left-turn	All				<5,000/lane(Total)		15		24				Simple Before-After
	Left-turn	All				>5,000/lane(Total)		15		24				Simple Before-After
	Left-turn	Fatal/Injury						15		50				Simple Before-After
	ROR	PDO						15		50				Simple Before-After
	Overturn	All				<5,000/lane(Total)		15		50				Simple Before-After
	Overturn	All				>5,000/lane(Total)		15		28				Simple Before-After
	Rear-end	All				<5,000/lane(Total)		15		50				Simple Before-After
	Rear-end	All				>5,000/lane(Total)		15		28				Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day) Major	Daily Traffic Volume (veh/day) Minor	Ref	Obs	Effectiveness Crash Reduction Factor / Function	Effectiveness Std Error	Effectiveness Range Low	Effectiveness Range High	Study Type
Install left-turn lane (physical channelization) (cont'd)	Rear-end	Fatal/Injury						15		11				Simple Before-After
	Rear-end	PDO						15		56				Simple Before-After
	Right-angle	All				<5,000/lane(Total)		15		68				Simple Before-After
	Right-angle	All				>5,000/lane(Total)		15		55				Simple Before-After
	Right-angle	Fatal/Injury						15		58				Simple Before-After
	Right-angle	PDO						15		54				Simple Before-After
Install left-turn lane (signal has left-turn phase)	All	All			Signal			28		31		25	36	
	All	All			Signal			51		35				
	Left-turn	All			Signal			28		44		43	45	
	Older-driver head-on	All		4-Leg	Signal			39	13	73				
	Younger-driver head-on	All		4-Leg	Signal			39	13	66				
Install left-turn lane (signal has no turn phase)	All	All			Signal			28		23		21	25	
	Left-turn	All			Signal			28		50		46	54	
Install left-turn lane (with channelization and existing left-turn phase)	All	All			Signal			15		35				
	All	All			Signal			15		35				Simple Before-After
	All	All			Signal			15		35				Cross-section
Install left-turn lane (with channelization and no left-turn phase)	All	All						15		15				
	All	All						15		15				Simple Before-After
	All	All						15		15				Cross-section

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major	Minor	Ref	Obs	Effectiveness				Study Type
						Daily Traffic Volume (veh/day)				Crash Reduction Factor / Function	Std Error	Range		
												Low	High	
Install left-turn lane (within existing curbs)	All	All			Signal			28		26				
	Left-turn	All			Signal			28		66				
Install left-turn refuge within flush median	All	All				<5,000/lane(Total)		15		24				Simple Before-After
	All	All				>5,000/lane(Total)		15		44				Simple Before-After
	Head-on	All				>5,000/lane(Total)		15		52				Simple Before-After
	Left-turn	All				>5,000/lane(Total)		15		77				Simple Before-After
	Overturn	All				<5,000/lane(Total)		15		44				Simple Before-After
	Overturn	All				>5,000/lane(Total)		15		40				Simple Before-After
	Rear-end	All				<5,000/lane(Total)		15		44				Simple Before-After
	Rear-end	All				>5,000/lane(Total)		15		40				Simple Before-After
	Sideswipe	All				>5,000/lane(Total)		15		52				Simple Before-After
Remove left-turn lane	All	All	Rural	3-Leg	Signal			6		-18				
	All	All	Rural	4-Leg (1 app)	Signal			6		-22				
	All	All	Rural	4-Leg (2 app)	Signal			6		-49				
	All	All	Urban	3-Leg	Signal			6		-8				
	All	All	Urban	3-Leg	Stop			6		-49				
	All	All	Urban	4-Leg (1 app)	Signal			6		-11				
	All	All	Urban	4-Leg (1 app)	Stop			6		-37				
	All	All	Urban	4-Leg (2 app)	Signal			6		-23				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major Daily Traffic Volume (veh/day)	Minor Daily Traffic Volume (veh/day)	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Remove left-turn lane (cont'd)	All	All	Urban	4-Leg (2 app)	Stop			6		-88				
	All	Fatal/Injury	Rural	3-Leg	Signal			6		-16				
	All	Fatal/Injury	Rural	4-Leg (1 app)	Signal			6		-21				
	All	Fatal/Injury	Rural	4-Leg (2 app)	Signal			6		-45				
	All	Fatal/Injury	Urban	3-Leg	Signal			6		-6				
	All	Fatal/Injury	Urban	3-Leg	Stop			6		-53				
	All	Fatal/Injury	Urban	4-Leg (1 app)	Signal			6		-10				
	All	Fatal/Injury	Urban	4-Leg (1 app)	Stop			6		-41				
	All	Fatal/Injury	Urban	4-Leg (2 app)	Signal			6		-21				
	All	Fatal/Injury	Urban	4-Leg (2 app)	Stop			6		-98				
RIGHT-TURN COUNTERMEASURES														
Increase length of right-turn lane	All	Fatal/Injury	All	All	All			58		15				
Install right-turn lane	All	All	All	4-Leg (1 app)	Signal	4,200-55,100	100-26,000	22		**4**	2			EB Before-After
	All	All	All	4-Leg (1 app)	Stop	1,100-40,600	25-11,800	22		**14**	5			EB Before-After
	All	All	All	4-Leg (2 app)	Signal	4,200-55,100	100-26,000	22		**8**	3			EB Before-After
	All	All	All	4-Leg (2 app)	Stop	1,100-40,600	25-11,800	22		**26**	7			EB Before-After
	All	All	All	All	All			58		35				
	All	All	All					1		25				
	All	All	Rural	4-Leg (1 app)	No signal			28		14				
	All	All	Rural	4-Leg (1 app)	No signal			28		21		14	27	

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day) Major	Daily Traffic Volume (veh/day) Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Install right-turn lane (cont'd)	All	All		All	No signal			28		27		24	30	
	All	All						15		25				
	All	All						15		25				Cross-section
	All	All						15		25				Simple Before-After
	All	All						15		25				Simple Before-After
	All	Fatal/Injury	All	4-Leg (1 app)	Signal	4,200-55,100	100-26,000	22		**9**	3			EB Before-After
	All	Fatal/Injury	All	4-Leg (1 app)	Stop	1,100-40,600	25-11,800	22		**23**	7			EB Before-After
	All	Fatal/Injury	All	All	No signal			58		35				
	All	Fatal/Injury	All	All	Signal			58		35				
	All	Fatal/Injury	All	All				51		40				
	All	Fatal/Injury	Rural	All	All			58		35				
	All	Fatal/Injury	Urban	All	All			58		30				
	Rear-end	All						15		65				Simple Before-After
	Right-angle	All						15		50				Simple Before-After
	Right-turn	All						15		53				
	Right-turn	All						15		56				Simple Before-After
	Right-turn	All						15		50				Cross-section
	Sideswipe	All						15		20				Simple Before-After
Install right-turn lane (painted separation)	All	Fatal/Injury	All	All	All			58		30				
Install right-turn lane (physical channelization)	All	Fatal/Injury	All	All	All			58		35				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major	Minor	Ref	Obs	Effectiveness				Study Type
						Daily Traffic Volume (veh/day)				Crash Reduction Factor / Function	Std Error	Range		
												Low	High	
OTHER GEOMETRIC COUNTERMEASURES														
Convert four-leg to two T-intersections	All	All		4-Leg	No signal			28		57				
	All	Fatal/Injury	Urban	4-Leg		<70%*	>30%*	13		**33**	6			Meta-analysis
	All	Fatal/Injury	Urban	4-Leg		>85%*	<15%*	13		**-35**	15			Meta-analysis
	All	Fatal/Injury	Urban	4-Leg		70-85%*	15-30%*	13		**25**	5			Meta-analysis
	All	PDO	Urban	4-Leg		<70%*	>30%*	13		**10**	5			Meta-analysis
	All	PDO	Urban	4-Leg		>85%*	<15%*	13		**-15**	6			Meta-analysis
	All	PDO	Urban	4-Leg		70-85%*	15-30%*	13		0	5			Meta-analysis
	All	All		4-Leg				51		57				Meta-analysis
Convert intersection to roundabout	All	All	All		All			50	55	**35**	3			EB Before-After
	All	All	All		Signal			50	9	**48**	5			EB Before-After
	All	All	All		Signal			21	23	40				EB Before-After
	All	All	All		Stop (2-way)			50	36	**44**	4			EB Before-After
	All	All	All		Stop (4-way)			50	10	-3	15			EB Before-After
	All	All	Rural	1-lane	Stop (2-way)			50	9	**72**	4			EB Before-After
	All	All	Rural		Stop	7,185-17,220		44		**58**	7			EB Before-After
	All	All		3-Leg				15		50				Simple Before-After
	All	All		4-Leg				15		75				Simple Before-After

* Percentage of Total Daily Traffic Volume

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day) Major	Daily Traffic Volume (veh/day) Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
Convert intersection to roundabout (cont'd)	All	Fatal/Injury						55	181	65				Simple Before-After
	All	PDO						55	181	42				Simple Before-After
	Ped	All						55	181	89				Simple Before-After
	All	All	Urban		Stop	13,272-30,418		44		5	10			EB Before-After
	All	All	Urban		Signal	5,322-31,525		44		**35**	9			EB Before-After
	All	All	Urban		Signal			50	5	1	12			EB Before-After
	All	All	Urban		Signal			21	4	35				EB Before-After
	All	All	Urban		Stop (2-way)			50	27	**31**	6			EB Before-After
	All	All	Urban	1-lane	Stop (2-way)			50	16	**56**	6			EB Before-After
	All	All	Urban	2-lane	Signal			50	4	**67**	4			EB Before-After
	All	All	Urban	2-lane	Stop (2-way)			50	11	**18**	8			EB Before-After
	All	All	Urban		Stop	4,600-17,825		44		**72**	6			EB Before-After
	All	Fatal/Injury	All		All			50	55	**76**	3			EB Before-After
	All	Fatal/Injury	All		Signal			50	9	**78**	6			EB Before-After
	All	Fatal/Injury	All		Stop (2-way)			50	36	**82**	3			EB Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day) Major	Daily Traffic Volume (veh/day) Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
Convert intersection to roundabout (cont'd)	All	Fatal/Injury	All		Stop (4-way)			50	10	-28	41			EB Before-After
	All	Fatal/Injury	All		All			21	23	80				EB Before-After
	All	Fatal/Injury	Rural	1-lane	Stop (2-way)			50	9	**87**	3			EB Before-After
	All	Fatal/Injury	Rural		Stop	7,185-17,220		44		**82**	9			EB Before-After
	All	Fatal/Injury			No signal			11	62	44		34	52	EB and Meta-analysis
	All	Fatal/Injury			Signal			11	34	32		19	43	EB and Meta-analysis
	All	Fatal/Injury						11	96	39		31	45	EB and Meta-analysis
	All	Fatal/Injury	Urban		Signal			50	5	**60**	12			EB Before-After
	All	Fatal/Injury	Urban		Stop (2-way)			50	27	**74**	6			EB Before-After
	All	Fatal/Injury	Urban	1-lane	Stop (2-way)			50	16	**78**	7			EB Before-After
	All	Fatal/Injury	Urban	2-lane	Stop (2-way)			50	11	**72**	9			EB Before-After
	All	Fatal/Injury	Urban		Signal	5,322-31,525		44		**74**	14			EB Before-After
	All	Fatal/Injury	Urban		Stop	4,600-17,825		44		**88**	8			EB Before-After
	Ped	Fatal/Injury			No signal			11		27				
	Ped	Fatal/Injury			Signal			11		-28				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day) Major	Daily Traffic Volume (veh/day) Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Improve intersection alignment (reduce skew)	All	All	Rural	3-Leg	Stop			6		100(1-EXP(0.0048*|intersection angle - 90º|)); angle in degrees				
	All	All	Rural	4-Leg	Stop			6		100(1-EXP(0.0054*|intersection angle - 90º|)); angle in degrees				
Improve sight distance in 1 quadrant	All	All	Rural	4-Leg	Stop/Yield (2-way)			23		5				Expert Panel
Improve sight distance in 2 quadrants	All	All	Rural	4-Leg	Stop/Yield (2-way)			23		9				
Improve sight distance in 3 quadrants	All	All	Rural	4-Leg	Stop/Yield (2-way)			23		13				
Improve sight distance in 4 quadrants	All	All	Rural	4-Leg	Signal			23		0				
	All	All	Rural	4-Leg	Stop/Yield (2-way)			23		17				
Improve sight distance to intersection	All	Fatal						51		56				
	All	Injury						51		37				
Increase median width by 3 ft	Multiple-vehicle	All	Rural	4-Leg	Stop			24		**4**	1			Cross-section
	Multiple-vehicle	All	Urban	3-Leg	Stop			24		**-3**	1			Cross-section
	Multiple-vehicle	All	Urban	4-Leg	Signal			24		**-3**	1			Cross-section
	Multiple-vehicle	All	Urban	4-Leg	Stop			24		**-6**	1			Cross-section
	Multiple-vehicle	Fatal/Injury	Rural	4-Leg	Stop			24		**4**	1			Cross-section
	Multiple-vehicle	Fatal/Injury	Urban	4-Leg	Signal			24		**-3**	1			Cross-section
	Multiple-vehicle	Fatal/Injury	Urban	4-Leg	Stop			24		**-5**	1			Cross-section

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day) Major	Daily Traffic Volume (veh/day) Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Increase pedestrian storage area at corner	All	Fatal/Injury						5		-12	126			Meta-analysis
Install median	All	All	Rural		Stop			6		27				
Install median islands (painted) on major road approaches	All	Fatal/Injury	All	All	All			58		15				
Install median islands (physical) on major road approaches	All	Fatal/Injury	All	All	All			58		25				
Install raised median	All	All			No signal			28		25				
	All	All						28		25				
	Ped	All			No signal			28		69				
Install raised median (marked crosswalk)	Ped	All						60		46				
Install raised median (unmarked crosswalk)	Ped	All						60		39				
Install refuge islands	Ped	All						28		56				
Install splitter islands on minor road approaches	All	Fatal/Injury	All	3-Leg	All			58		45				
	All	Fatal/Injury	All	4-Leg	All			58		40				
	All	Fatal/Injury	All	All	All			58		40				
	All	Fatal/Injury	Rural	All	All			58		35				
	All	Fatal/Injury	Urban	All	All			58		40				
Install turn and bypass lanes	All	All	Rural		Stop			48		5	10			Simple Before-After
	Head-on	PDO		3-Leg				15		13				Simple Before-After
	Left-turn	Injury		3-Leg				15		36				Simple Before-After
	Left-turn	PDO		3-Leg				15		28				Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major	Minor	Ref	Obs	Effectiveness				Study Type
						Daily Traffic Volume (veh/day)				Crash Reduction Factor / Function	Std Error	Range		
												Low	High	
Install turn and bypass lanes (cont'd)	ROR	PDO		3-Leg				15		40				Simple Before-After
	Rear-end	Injury		3-Leg				15		18				Simple Before-After
	Rear-end	PDO		3-Leg				15		21				Simple Before-After
	Right-angle	Injury		3-Leg				15		24				Simple Before-After
	Right-angle	PDO		3-Leg				15		53				Simple Before-After
	Sideswipe	PDO		3-Leg				15		30				Simple Before-After
Vary median width	All	All	Rural		Stop			6		100(1-EXP(-0.012(Wm-16))); Wm=median width (ft)				
	All	All	Urban	3-Leg	Stop			6		100(1-EXP(0.0082(Wm-16))) for Wm>16 1.0 for Wm<=16; Wm=median width (ft)				
	All	All	Urban	4-Leg	Stop			6		100(1-EXP(0.0173(Wm-16))) for Wm>16 1.0 for Wm<=16; Wm=median width (ft)				
	All	Fatal/Injury	Urban	3-Leg	Stop			6		100(1-EXP(0.0076(Wm-16))) for Wm>16 1.0 for Wm<=16; Wm=median width (ft)				
	All	Fatal/Injury	Urban	4-Leg	Stop			6		100(1-EXP(0.016(Wm-16))) for Wm>16 1.0 for Wm<=16; Wm=median width (ft)				
Vary shoulder width	All	All	Rural	3-Leg and 4-Leg	Stop			6		100(1-EXP(-0.03(Ws-8))); Ws=outside shoulder width (ft)				
	All	All	Urban		Stop			6		100(1-EXP(-0.02(Ws-1.5))); Ws=outside shoulder width (ft)				

Table 3: Signs / Markings / Operational Countermeasures

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major	Minor	Ref	Obs	Effectiveness				Study Type
						Daily Traffic Volume (veh/day)				Crash Reduction Factor / Function	Std Error	Range Low	Range High	
SIGNS														
Install double stop signs	All	All			No signal			28		11				
	Right-angle	All			No signal			47	10	55	52	-38	100	Simple Before-After
	Right-angle	All			No signal			28		36				
Install flashing beacons as advance warning	All	All		3-Leg				15		70				Simple Before-After
	All	All		4-Leg				15		39				Simple Before-After
	All	All			Signal			28		27		25	28	
	All	All						15		25				
	All	All						15		25				Cross-section
	All	All						15		27				Simple Before-After
	All	All						15		25				Simple Before-After
	Left-turn	Fatal/Injury						15		67				Simple Before-After
	Left-turn	PDO						15		79				Simple Before-After
	Rear-end	All		4-Leg	Signal			39		36				
	Right-angle	All		4-Leg	Signal			39		62				
	Right-angle	Fatal/Injury						15		73				Simple Before-After
	Right-angle	Fatal/Injury						15		73				Simple Before-After
	Right-angle	PDO						15		62				Simple Before-After
Install larger stop signs	All	All			Stop	>5,000/lane(Total)		15		19				Simple Before-After
Install pedestrian signing	All	All						15		4				
	Ped	All						15		15				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day) Major	Daily Traffic Volume (veh/day) Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Install advance warning signs (positive guidance)	All	All	All					1		35				
	All	All			Signal			28		22		3	40	
	All	All	Urban					15		30				Cross-section
	All	All	Rural					15		40				
	Right-angle	All			Signal			47	11	35		20	100	Simple Before-After
	Right-angle	All			Signal			28		35				
Provide overhead lane-use signs	Rear-end	All						51		10				
	Sidewipe	All						51		20				
PAVEMENT MARKINGS/MODIFICATIONS														
Add centerline and move STOP bar to extended curb lines	All	All			No signal			28		29				
	Right-angle	All			No signal			28		24				
Add centerline and move STOP bar to extended curb lines, double stop signs	All	All			No signal			28		9				
	Right-angle	All			No signal			28		0				
Add centerline and STOP bar, replace 24-inch with 30-inch stop signs	Right-angle	All			No signal			47		67	11	27	100	Simple Before-After
	Right-angle	All			No signal			28		67				
Improve pavement friction (groove)	All	All						28		25				
	Wet	All						28		59		42	75	
Improve/install pedestrian crossing	All	All						15		25				
	Ped	All						15		25				
Install pedestrian crossing	Ped	All						15		25				
	Ped	All						15		25				
	Ped	Fatal/Injury	Rural					38		60				EB Before-After
Install pedestrian crossing (raised)	All	All						5		30	67			Meta-analysis
	All	Fatal/Injury						5		36	54			Meta-analysis
	Ped	All						28		8				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day) Major	Daily Traffic Volume (veh/day) Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Install raised intersection	All	Fatal/Injury		4-Leg				13		-5				Meta-analysis
	All	PDO		4-Leg				13		-13				Meta-analysis
Install raised pavement markers	All	All						28		10		6	13	
	Wet	All						28		25		20	30	
	Wet/Night	All						28		33		20	46	
Install STOP bars (pedestrian crosswalk)	All	All			Signal			28		18		10	25	
Install STOP bars (STOP bar on minor road approaches, with short segments of centerline)	All	All						28		19		10	27	
	Right-angle	All						28		47				
Install transverse pavement markings	All	All						15		18				Simple Before-After
	Speed-related	Fatal/Injury			Stop			18		57	8			Simple Before-After
	Speed-related	Serious injury			Stop			18		74	13			Simple Before-After
	Speed-related	Slight injury			Stop			18		52	11			Simple Before-After
	Speed-related and day	All			Stop			18		66	8			Simple Before-After
	Speed-related and dry	All			Stop			18		45	15			Simple Before-After
	Speed-related	All			Stop			18		48	14			Simple Before-After
	Speed-related and wet	All			Stop			18		68	11			Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major	Minor	Ref	Obs	Effectiveness				Study Type
						Daily Traffic Volume (veh/day)				Crash Reduction Factor / Function	Std Error	Range		
												Low	High	
Install transverse rumble strips on approaches	All	All	Rural		No signal			28		35				
	All	All			Stop			15		28				Simple Before-After
	All	All						28		23		2	44	
	Rear-end	All						15		90				Simple Before-After
Mark pavement with supplementary warning messages	All	All			No signal			28		6				
	Right-angle	All			No signal			28		30				
	Right-angle	All	Urban		Stop			47	5	30	66	-20	100	Simple Before-After
Provide bicycle box (advance stop bar to leave dedicated space for cyclists)	Bicycle	All			Signal			51		35				
Provide bike lanes	Bicycle	All						51		36				
Resurface pavement	All	All						28		33		7	59	
	Wet	All						28		47		42	75	
REGULATORY														
Convert STOP control to Yield control	All	All	All		Stop			21	141	-137				Comparison Group Before-After
	All	All	Urban	4-Leg	Stop			33		-127	70			Comparison Group Before-After
Convert to all-way STOP control (from 2-way control)	All	All	All		Stop			21	360	47				Before-After with Likelihood Functions
	All	All			No signal			28		64		53	74	
	All	All			Stop			15		53				
	All	Fatal/Injury	Urban		Stop			30		71	6			Simple Before-After
	Left-turn	All	Urban		Stop			30		20	52			Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major	Minor	Ref	Obs	Effectiveness				Study Type
						Daily Traffic Volume (veh/day)				Crash Reduction Factor / Function	Std Error	Range		
												Low	High	
Convert to all-way STOP control (from 2-way control) (cont'd)	Left-turn	All			Stop			15		20				Cross-section
	Ped	All						15		39				
	Ped	All	Urban		Stop			30		**39**	8			Before-After
	Rear-end	All	Urban		Stop			30		13	13			Simple Before-After
	Rear-end	All			Stop			15		13				Cross-section
	Right-angle	All	Urban		Stop			30		72	3			Simple Before-After
	Right-angle	All			No signal			28		84				
	Right-angle	All			Stop			15		72				Cross-section
	Right-angle	All	Urban		Stop			47	10	80	41	49	100	Simple Before-After
Convert two-way to one-way roadway	All	All						15		26				
	All	All						15		26				Cross-section

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day) Major	Daily Traffic Volume (veh/day) Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Convert Yield control to STOP control	All	All			No signal			28		29				
	Right-angle	All			No signal			28		9				
Install no left-turn and no u-turn signs	All	All	Urban			19,435-42,000(Total)		7		62	6			Simple Before-After
	Left-turn (or u-turn)	All	Urban			19,435-42,000(Total)		7		59	5			Simple Before-After
Permit right-turn-on-red	All	All			Signal			5		-7	1			Simple Before-After
	All	All			Signal			10		-5	1			Simple Before-After
	Ped	All	New Orleans		Signal			5		-81	88			Before-After
	Ped	All	New York		Signal			5		-43	24			Before-After
	Ped	All	Ohio		Signal			5		-57	31			Before-After
	Ped	All	Wisconsin		Signal			5		-108	51			Before-After
	Right-turn	Fatal/Injury			Signal			13		-60	5			Meta-analysis
	Right-turn	PDO			Signal			13		-10	1			Meta-analysis
Prohibit left-turns	All	All						15		45				
	All	All						15		45				Cross-section
	Left-turn	All						15		90				Cross-section
	Ped	All						15		10				
	Rear-end	All						15		30				Cross-section
Prohibit right-turn-on-red	All	All			Signal			28		23		20	25	
	ROR	All			Signal			15		30				Cross-section
	Rear-end	All			Signal			15		20				Cross-section

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Major	Minor	Ref	Obs	Effectiveness				Study Type
						Daily Traffic Volume (veh/day)				Crash Reduction Factor / Function	Std Error	Range Low	Range High	
Prohibit right-turn-on-red (cont'd)	Right-angle	All			Signal			15		30				Cross-section
	Sideswipe	All			Signal			15		20				Cross-section
Prohibit turns	All turns	All	All					1		45		40	90	
Restrict parking near intersections (to off-street)	All	All						28		49		8	90	
	Ped	All						15		30				
Vary speed	All	All	Rural					6		100(1-EXP(0.019(V-55))); V=major-road speed limit (or design speed) (mph)				
	All	All	Urban					6		100(1-EXP(0.005(V-40))); V=major-road speed limit (or design speed) (mph)				
LIGHTING														
Improve lighting at intersection	Ped	Fatal						5		78	87			
	Ped	Injury						5		**42**	18			
Install lighting	All	All			Signal			51		30				
	All	Fatal/Injury			Signal			51		17				
	Night	All			Signal			51		50				
	All	All			No Signal			28		47				
OPERATIONAL														
Convert STOP control (2-way) to signal control	All	All			Stop			15		28				Cross-section
	All	Injury			Stop			15		43				Cross-section
	Right-angle	All			Stop			15		74				Cross-section
Convert STOP control (2-way) to signal control and install left-turn lane	All	All			Stop			15		36				Cross-section
	All	Injury			Stop			15		53				Cross-section
	Rear-end	All			Stop			15		8				Cross-section
	Right-angle	All			Stop			15		74				Cross-section

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day): Major	Daily Traffic Volume (veh/day): Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Std Error	Range: Low	Range: High	Study Type
Increase enforcement to reduce speed	Ped	All						28		70				
Install angled median crosswalk	All	All						28		12				
Install beacon (flashing) at intersection	All	All	All					1		30		7	50	
	All	All	All					1		30				
	All	All			Signal			28		34		30	38	
	All	All						15		30				
	All	All						15		30				Cross-section
	All	All						15		4				Simple Before-After
	All	All						15		30				Simple Before-After
Install cameras to detect red-light running	All	All			Signal	17,000-78,000		37	46	**-12**	5			EB Before-After
	All	All	Urban (Scottsdale)		Signal			56		11				EB Before-After
	All	Fatal/Injury	All	All	Signal			58		5				
	All	Fatal/Injury			Signal	17,000-78,000		37	46	-14	9			EB Before-After
	Left-turn	All	Urban (Scottsdale)		Signal			56	14	**45**	6			EB Before-After
	Rear-end	All			Signal	52,625-109,067	12,562-33,679	45		**-15**	3			EB Before-After
	Rear-end	All			Signal	17,000-78,000		37	13	**-57**	1			EB Before-After
	Rear-end	All	Urban (Scottsdale)		Signal			56		**-41**	11			EB Before-After
	Rear-end	Fatal/Injury			Signal	52,625-109,067	12,562-33,679	45		**-24**	12			EB Before-After
	Right-angle	All			Signal	52,625-109,067	12,562-33,679	45		**25**	3			EB Before-After
	Right-angle	All	Urban (Scottsdale)		Signal			56	14	20				EB Before-After
	Right-angle	Fatal/Injury			Signal	52,625-109,067	12,562-33,679	45		**16**	6			EB Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day): Major	Daily Traffic Volume (veh/day): Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Std Error	Range: Low	Range: High	Study Type
Install far-side bus stops	Ped	All						28		1				
Install flashing red/yellow signal (MUTCD: intersection control beacon)	All	All			No signal	<5,000/lane(Total)		15		25				Simple Before-After
	All	All			No signal	>5,000/lane(Total)		15		26				Simple Before-After
	All	All			No signal			15		26				
	All	Fatal/Injury			No signal			15		50				Simple Before-After
	Head-on	All			No signal			15		50				Simple Before-After
	Right-angle	All			No signal	<5,000/lane(Total)		15		35				Simple Before-After
	Right-angle	All			No signal	>5,000/lane(Total)		15		36				Simple Before-After
	Right-angle	All			No signal			15		36				
Install pedestrian crossing (signed and marked with curb ramps and extensions)	All	All			No signal			28		37		25	48	
Install pedestrian overpass/underpass	Ped	All			No signal			28		13				
Install stop signs at alternate intersections in residential areas	All	All	Urban		Stop			53		50		45	55	
	All	Fatal/Injury	Urban		Stop			53		67		61	72	
Vary frequency of driveways within 250 ft of intersection	All	All	Rural		Signal			6		100(1-EXP(0.046(Nd-3))); Nd=number of driveways on the major road within 250ft of the intersection				
	All	All	Rural		Stop			6		100(1-EXP(0.056(Nd-3))); Nd=number of driveways on the major road within 250ft of the intersection				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Config	Control	Daily Traffic Volume (veh/day) Major	Daily Traffic Volume (veh/day) Minor	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
Vary lane width	All	All	Urban		Signal			6		100(1-EXP(-0.053(Wl-12))); Wl=lane width (ft)				
	All	All	Urban		Stop			6		100(1-EXP(-0.057(Wl-12))); Wl=lane width (ft)				
Vary sight distance	All	All	Rural		Signal			6		0				
Vary through lanes	All	All	Rural		Signal			6		100(1-EXP(0.007(Nln-2))); Nln=number of through lanes on the road				
	All	All	Rural		Stop			6		100(1-EXP(-0.093(Nln-2))); Nln=number of through lanes on the road				
Vary truck presence	All	All	Rural	4-Leg	Signal			6		100(1-EXP(0.026(Pt-9))); Pt=percent truck during the peak hour (average for all intersection movements)				
	All	Fatal/Injury	Rural	3-Leg	Stop			6		100(1-EXP(-0.0253(Pt-9))); Pt=percent truck during the peak hour (average for all intersection movements)				
	All	Fatal/Injury	Rural	4-Leg	Stop			6		100(1-EXP(-0.0520(Pt-9))); Pt=percent truck during the peak hour (average for all intersection movements)				
	All	Fatal/Injury	Rural	4-Leg	Signal			6		100(1-EXP(0.0323(Pt-9))); Pt=percent truck during the peak hour (average for all intersection movements)				

Tables for Roadway Departure Crash Reduction Factors

Table 4: Barrier Countermeasures

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range Low	Range High	
BARRIER COUNTERMEASURES											
Improve guardrail	All	All			<5,000/lane	15	18				
	All	All			>5,000/lane	15	9				
	All	All	All	All		1	5				
	All	All				15	5				
	All	All				15	6				
	All	All				15	7				
	All	All				15	7				
	All	All				15	11				
	All	All				15	15				
	All	All				15	15				
	All	All				15	20				
	All	Fatal	All	All		1	50				
	All	Injury				15	35				
	All	Injury	All	All		1	35				
	Fixed object	All			<5,000/lane	15	23				
	Fixed object	All			>5,000/lane	15	18				
	Fixed object	All				15	21				
	ROR	All				15	26				
	ROR	All			>5,000/lane	15	32				
	ROR	All				15	28				
	Overturn	All			<5,000/lane	15	41				
	Overturn	All			>5,000/lane	15	27				
	Overturn	All				15	34				
	Rear-end	All			<5,000/lane	15	41				
	Rear-end	All			>5,000/lane	15	27				
	Rear-end	All				15	34				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Install animal fencing	Animal	All				15	80				
	Animal	All	All	All		1	90				
	Animal	All				15	70				
	Animal	All				15	90				
	Animal	Injury				15	91				
	Animal	PDO				15	61				
	Animal head-on	All				15	85				
Install barrier (concrete) inside and outside curve	All	Fatal/ Injury				15	39				
Install guardrail (as shield for rocks and posts)	All	All				15	14				
	All	Injury				15	31				
	Fixed object	All				15	100				
Install guardrail (as shield for trees)	All	Fatal				15	65				
	All	Injury				15	51				
Install guardrail (at culvert)	All	All				15	27				
	All	All				15	24				
	All	All				15	30				
Install guardrail (at ditch)	All	Injury				15	26				
Install guardrail (at embankment)	All	Injury				15	42				
	ROR	All		All		5	7	31			Meta Analysis
	ROR	Fatal		All		5	44	10			Meta Analysis
	ROR	Injury		All		5	47	5			Meta Analysis
Install guardrail (inside curves)	All	Fatal/ Injury				15	28				
Install guardrail (outside curves)	All	Fatal/ Injury				15	63				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range Low	Range High	
Install impact attenuators	All	All				15	29				
	All	All	All	All		1	5				
	All	All				15	5				
	All	All				15	20				
	All	All				15	20				
	All	All				15	35				
	All	All				15	41				
	All	All				15	50				
	All	Fatal	All	All		1	75				
	All	Fatal				15	75				
	All	Fatal				15	83				
	All	Fatal				15	90				
	All	Injury	All	All		1	50				
	All	Injury				15	50				
	Fixed object	Fatal	All	All		5	69	28			Meta Analysis
	Fixed object	Injury	All	All		5	69	10			Meta Analysis
	Fixed object	PDO				5	46	30			Meta Analysis
	ROR	All				15	45				
Replace guardrail with a softer material (concrete→steel→wire)	ROR	Fatal		All		5	41	31			Meta Analysis
	ROR	Injury		All		5	**32**	10			Meta Analysis

Table 5: Bridge Countermeasures

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
BRIDGE COUNTERMEASURES											
Install bridge lighting	All	All				15	59				
Install delineators (on bridges)	All	All				15	43				
	All	All				15	39				
	All	All				15	40				
	All	All				15	50				
Install guardrail (at bridge)	All	All			<5,000/lane	15	22				
	All	All			>5,000/lane	15	20				
	All	All				15	11				
	All	All				15	24				
	All	All				15	24				
	All	All				15	44				
	All	Fatal				15	90				
	All	Injury				15	45				
	Overturn	All			<5,000/lane	15	41				
	Overturn	All			>5,000/lane	15	32				
	Rear-end	All			<5,000/lane	15	37				
	Rear-end	All			>5,000/lane	15	32				
	Wet	All				15	50				
Repair bridge deck	All	All				15	14				
	All	All				15	13				
	All	All				15	15				
Replace bridge (general)	All	All	All	All		1	45				
Replace bridge (2-lane)	All	All				15	45				
Upgrade bridge parapet	All	All				15	5				
Upgrade bridge railing	All	All				15	20				
	All	All	All	All		1	5				
	All	Fatal				15	76				
	All	Fatal				15	60				
	All	Fatal				15	92				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Upgrade bridge railing (cont'd)	All	Injury				15	61				
	All	Injury	All	All		1	30				
	All	Injury				15	30				
	All	Injury				15	92				
	All	PDO				15	50				
Vary bridge width	All	All	Rural	Rural Highway		6	100(1-(EXP(-0.135Ibr(Wb-12)-1.0)Ps+1.0)); Ibr=presence of bridges (1 if one or more bridges present, 0 if not), Wb=bridge width – approach traveled-way width (ft), Ps=proportion of crash type subset (for values of Ps, refer to source).				
Vary horizontal bridge radius	All	All	Urban	Urban Street		6	100(1-(2.30(EXP(-2298/R)+343.8/R)(1-Poff-road)+0.781(EXP(320.9/R)Poff-road))); Poff-road=proportion of crashes that occur off the roadway.				
Widen bridge	All	All				15	45				
	All	All	All	All		1	45				
	All	All				15	36				
	All	All				15	40				
	All	All				15	45				
	All	All				15	47				
	All	All				15	48				
	All	All				15	55				
	All	Fatal/ Injury				15	92				
	All	PDO				15	95				
	Fixed object	All				15	45				
	Fixed object	All				15	40				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Widen bridge (cont'd)	Fixed object	All				15	50				
	Head-on	All				15	45				
	Head-on	All				15	40				
	Head-on	All				15	50				
	ROR	All				15	44				
	Sideswipe	All				15	49				
	Sideswipe	All				15	40				
	Sideswipe	All				15	50				
	Sideswipe	All				15	57				
Widen bridge (18 to 24 ft)	All	All				15	68				
Widen bridge (18 to 30 ft)	All	All				15	93				
Widen bridge (20 to 24 ft)	All	All				15	56				
Widen bridge (20 to 30 ft)	All	All				15	90				
Widen bridge (22 to 24 ft)	All	All				15	36				
Widen bridge (22 to 30 ft)	All	All				15	86				

Table 6: Geometric Countermeasures

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
GEOMETRIC COUNTERMEASURES											
Change shoulder type and/or width	All	All	Rural			21	100(1-((AMFWRA x AMFTRA-1.0)PRA+1.0)), AMFWRA=accident modification factor for related accidents based on shoulder width (for values of AMfWRA, refer to source), AMFTRA=accident modification factor for related accidents based on shoulder type (for values of AMFTRA, refer to source), PRA=proportion of total crashes constituted by related crashes.				Expert Panel
Flatten crest vertical curve	All	All	All	All		27	20	19			EB Before-After
	All	Fatal/ Injury	All	All		27	**51**	19			EB Before-After
	All	Fatal/ Injury	Rural	2-lane		38	50				
Flatten horizontal curve	All	All				15	39				
	All	All	All	All		1	40				
	All	All				15	35				
	All	All	Rural			21	100(1-((1.55Lc+80.2/R-0.012Is)/1.55Lc)); Lc=length of horizontal curve (mi) without spirial curve length, R=curve radius (ft), Is=presence of a spiral transition curve (1 if a spiral transition is present, 0 otherwise).				Expert Panel
	All	Fatal				15	87				
	All	Injury				15	87				
	All	PDO				15	87				
	Fixed object	All			<5,000/lane	15	68				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Flatten horizontal curve (cont'd)	Fixed object	All			>5,000/lane	15	87				
	Head-on	All			<5,000/lane	15	67				
	Head-on	All			>5,000/lane	15	64				
	ROR	All			<5,000/lane	15	90				
	ROR	All			>5,000/lane	15	79				
	Overturn	All			<5,000/lane	15	73				
	Overturn	All			>5,000/lane	15	24				
	Rear-end	All			<5,000/lane	15	73				
	Rear-end	All			>5,000/lane	15	24				
	Rear-end	All				15	49				
Flatten horizontal curves (10 to 5 degrees)	All	All				15	45				
Flatten horizontal curves (15 to 5 degrees)	All	All				15	63				
Flatten horizontal curves (20 to 10 degrees)	All	All				15	48				
Flatten side slopes	All	All			<5,000/lane	15	43				
	All	All			>5,000/lane	15	45				
	All	All	All	All		1	30				
	All	All				15	25				
	All	All				15	30				
	All	All				15	32				
	All	All				15	35				
	Fixed object	All				15	62				
	ROR	All				15	10				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Flatten side slopes (11 to 8 degrees)	All	All				15	8				
	Ped	All				15	14				
	Right-turn	All				15	14				
Flatten side slopes (14 to 9 degrees)	All	All				15	7				
	All	Injury	Rural	2-lane		5	**22**	4			Meta Analysis
	All	PDO	Rural	2-lane		5	**24**	2			Meta Analysis
	Ped	All				15	12				
	Right-turn	All				15	12				
Flatten side slopes (18 to 9 degrees)	All	All	Rural	2-lane		15	11				
	ROR	All	Rural	2-lane		5	24	21			Cross-section
	Ped	All	Rural	2-lane		15	19				
	Right-turn	All				15	19				
Flatten side slopes (18 to 11 degrees)	All	All				15	8				
	Ped	All				15	14				
	Right-turn	All				15	14				
Flatten side slopes (18 to 14 degrees)	All	All				15	5				
	All	Injury	Rural	2-lane		5	**42**	4			Meta Analysis
	All	PDO	Rural	2-lane		5	**29**	4			Meta Analysis
	ROR	All	Rural	2-lane		5	18	16			Cross-section
	Ped	All				15	8				
	Right-turn	All				15	8				
Flatten side slopes (27 to 9 degrees)	All	All				15	12				
	Ped	All				15	21				
	Right-turn	All				15	21				
Flatten side slopes (27 to 11 degrees)	All	All				15	9				
	Ped	All				15	15				
	Right-turn	All				15	15				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Flatten side slopes (27 to 14 degrees)	All	All				15	6				
	Ped	All				15	10				
	Right-turn	All				15	10				
Flatten side slopes and remove guardrail	All	All	All	All		27	42	58			EB Before-After
Improve curve superelevation	All	All	Rural	All		21	0				Expert Panel
	All	All	Rural			21	100(1-(1.00+6(SD-0.01))); SD=superelevation deficiency between 0.01 and 0.02				Expert Panel
	All	All	Rural			21	100(1-(1.06+3(SD-0.02))); SD=superelevation deficiency greater than 0.02				Expert Panel
Improve gore area	All	All				15	25				
	All	All	All	All		1	25				
Improve horizontal and vertical alignments	All	All				15	58				
	All	All	All	All		1	50				
	All	All				15	50				
	All	All				15	50				
	All	All				15	73				
Improve longitudinal grade	All	All				15	49				
	All	All	All	All		1	40				
	All	All				15	40				
	All	All				15	57				
	All	Fatal/ Injury				15	87				
	All	PDO				15	83				
Improve superelevation	All	All				15	40				
	All	All				1	40				
	ROR	All				15	50				
Improve superelevation (for drainage)	All	All				15	45				
	All	All				15	40				
	All	All				15	49				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness					Study Type
							Crash Reduction Factor / Function	Std Error	Range			
									Low	High		
Increase number of lanes	All	All			<5,000/lane	15	20					
	All	All			>5,000/lane	15	31					
	All	All				15	10					
	All	All				15	20					
	All	All				15	22					
	All	All				15	25					
	All	All				15	25					
	All	All				15	25					
	All	Fatal				15	39					
	All	Injury				15	23					
	All	PDO				15	27					
	Head-on	All			<5,000/lane	15	38					
	Head-on	All			>5,000/lane	15	44					
	Head-on	All				15	53					
	Head-on	All				15	53					
	Head-on	PDO				15	50					
	Left-turn	All				15	71					
	Left-turn	PDO				15	67					
	ROR	All				15	44					
	ROR	All				15	26					
	ROR	All				15	44					
	ROR	All				15	44					
	ROR	PDO				15	50					
	Overturn	All			<5,000/lane	15	42					
	Overturn	All			>5,000/lane	15	52					
	Rear-end	All			<5,000/lane	15	42					
	Rear-end	All			>5,000/lane	15	52					
	Rear-end	All				15	32					
	Rear-end	All				15	32					
	Rear-end	All				15	40					
	Rear-end	All				15	53					
	Rear-end	PDO				15	53					

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
Increase number of lanes (cont'd)	Right-angle	All			<5,000/lane	15	35				
	Right-angle	All			>5,000/lane	15	45				
	Right-angle	All				15	15				
	Right-angle	PDO				15	46				
	Sideswipe	All			<5,000/lane	15	38				
	Sideswipe	All			>5,000/lane	15	44				
	Sideswipe	All				15	30				
	Sideswipe	All				15	30				
	Sideswipe	All				15	35				
	Sideswipe	PDO				15	64				
Increase vertical grade by 1%	All	All	Rural	2-lane		23	-1.6P; P=percent grade (absolute value)				
Install acceleration/ deceleration lanes	All	All				15	26				
	All	All	All	All		1	10				
	All	All				15	10				
	All	All				15	10				
	All	All				15	10				
	All	All				15	25				
	All	All				15	75				
	Rear-end	All				15	75				
	Sideswipe	All				15	75				
Install channelized lane	All	All				15	67				
	All	PDO				15	62				
	Rear-end	All				15	93				
Install climbing lane (where large difference between car and truck speed)	All	Fatal/ Injury	Rural	2-lane		38	33				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
Install passing/climbing lane	All	All	All	All		1	20				
	All	Fatal/ Injury	Rural	2-lane		38	33				
Install shoulder	All	All				15	9				
Install shoulder bus lanes	Head-on	Fatal/ Injury				15	50				
	Head-on	PDO				15	86				
	Left-turn	Fatal/ Injury				15	42				
	Left-turn	PDO				15	57				
	ROR	PDO				15	27				
	Right-angle	Fatal/ Injury				15	34				
	Right-angle	PDO				15	31				
	Sideswipe	Fatal/ Injury				15	27				
	Sideswipe	PDO				15	8				
Install truck escape ramp	All	All				15	18				
	ROR	All				15	75				
	Rear-end	All				15	33				
Lengthen culverts	All	All				15	44				
	All	All				15	40				
	All	All				15	48				
	All	All				15	30				
Narrow cross section (4 to 3 lanes with two way left-turn lane)	All	All	Urban	4-lane highway	8,000-17,400	17	**37**	1			EB Before-After
	All	All		4-lane		42	26		23	28	
	All	Fatal/ Injury	Urban	4-lane highway	8,000-17,400	17	**0**	2			EB Before-After
	All	PDO	Urban	4-lane highway	8,000-17,400	17	**46**	1			EB Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Narrow cross section (4 to 3 lanes with two way left-turn lane) (cont'd)	Left-turn	All	Urban	4-lane highway	8,000-17,400	17	**24**	2			EB Before-After
	Rear-end	All	Urban	4-lane highway	8,000-17,400	17	**31**	2			EB Before-After
	Right-angle	All	Urban	4-lane highway	8,000-17,400	17	**37**	1			EB Before-After
Reduce horizontal curve angle	All	All				15	38				
	All	All				15	40				
Reduce shoulder width (6 ft to 0 ft)	All	All	Rural	2-lane		20	-12	3			Cohort
Reduce shoulder width (6 ft to 1 ft)	All	All	Rural	2-lane		20	-17	6			Cohort
Reduce shoulder width (6 ft to 2 ft)	All	All	Rural	2-lane		20	-11	2			Cohort
Reduce shoulder width (6 ft to 4 ft)	All	All	Rural	2-lane		20	-6	2			Cohort
Reduce shoulder width (6 ft to 5 ft)	All	All	Rural	2-lane		20	-2	2			
Reduce vertical grade by 1%	All	All	Rural	2-lane		23	1.6P; P=percent grade (absolute value)				Expert Panel
Resurface pavement and improve superelevation	All	All				15	28				
	Wet pavement	All				15	51				
Stabilize shoulder	All	All				15	25				
Stabilize shoulder and dropoff	All	All	All	All		1	25				
Vary grade	All	All		Freeway		6	100(1-((EXP(bPg)-1.0)Ps+1.0)); b=regression coefficient (for values of b, refer to source), Pg=percent grade(absolute value), Ps=proportion of crash type subset (for values of Ps, refer to source).				
	All	All	Rural	Rural Highway		6	100(1-(EXP(bPg-1.0)1.0+1.0)); b=regression coefficient (for values of b, refer to source)., Pg=percent grade (absolute value).				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range Low	Range High	
Vary horizontal curvature	All	All	Rural	Rural Highway		6	100(1-((1.55Lc+80.2/R-0.012Is)/1.55Lc)); Lc=length of horizontal curve (mi), R=curve radius (ft), Is=presence of a spiral transition curve (1 if a spiral transition is present, 0 otherwise).				
Vary inside shoulder width	All	All		Freeway		6	100(1-((EXP(-0.021(Wis-Wsb))-1.0)(Pi/0.15)+1.0)); Wis=inside shoulder width (ft), Wsb=base inside shoulder width (ft) (=4.0 for four lanes, 10.0 for six or more lanes), Pi=proportion of crash type subset (for values of Pi, refer to source).				
	All	All	Rural	Rural Highway		6	100(1-((EXP(-0.021(Wis-4))-1.0)(Pi/0.16)+1.0)); Wis=inside shoulder width (ft), Pi=proportion of crash type subset (for values of Pi, refer to source).				
Vary lane width	All	All		Freeway		6	100(1-((EXP(-0.047(Wl-12))-1.0)(Pi/0.37)+1.0)); Wl=lane width (ft), Pi=proportion of crash type subset (for values of Pi, refer to source).				
	All	All	Rural	Rural Highway		6	100(1-((EXP(-0.047(Wl-12))-1.0)(Pi/0.36)+1.0)); Wl=lane width (ft), Pi=proportion of crash type subset (for values of Pi, refer to source).				
	All	All	Urban	Urban Street		6	100(1-((EXP(-0.040(Wl-12))-1.0)(Pi/0.24)+1.0)); Wl=lane width (ft), Pi=proportion of crash type subset (for values of Pi, refer to source)				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Vary outside shoulder width	All	All		Freeway		6	100(1-((EXP(-0.021(Ws-10))-1.0)(Pi/0.15)+1.0)); Ws=outside shoulder width (ft), Pi=proportion of crash type subset (for values of Pi, refer to source).				
	All	All	Rural	Rural Highway		6	100(1-((EXP(-0.021(Ws-8))-1.0)(Pi/0.16)+1.0)); Ws=outside shoulder width (ft), Pi=proportion of crash type subset (for values of Pi, refer to source).				
Vary shoulder width	All	All	Urban	Urban Street		6	100(1-((EXP(-0.014(Ws-1.5))-1.0)(Pi/0.088)+1.0)); Ws=shoulder width (ft), Pi=proportion of crash type subset (for values of Pi, refer to source).				
Vary side slopes	All	All	Rural	Rural Highway		6	100(1-((EXP(0.692(1/Ss-0.25))-1.0)Ps+1.0)), Ss= horizontal run for a 1ft change in elevation (average for length of segment, ft), Ps=proportion of crash type subset (for values of Ps, refer to source).				
Vary spiral transition curvature	All	All	Rural	Rural Highway		6	100(1-((1.55Lc+80.2/R-0.012)/(1.55Lc+80.2/R))); Lc=length of horizontal curve (mi), R=curve radius (ft).				
Vary superelevation	All	All	Rural	Rural Highway		6	0 through -15 according to the superelevation deficiency (refer to source).				
Vary uncurbed cross-sections	All	All	Urban	Urban Street		6	100(1-((EXP(-0.074)(1-Poff-road))+EXP(-0.225)Poff-road)); Poff-road=proportion of off-road crashes.				
Widen lane (add 1 ft to both sides)	Head-on	All				15	12				
	ROR	All				15	12				
	Sideswipe	All				15	12				
Widen lane (add 2 ft to both sides)	Head-on	All				15	23				
	ROR	All				15	23				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Widen lane (add 2 ft to both sides) (cont'd)	Sideswipe	All				15	23				
Widen lane (add 3 ft to both sides)	Head-on	All				15	32				
	ROR	All				15	32				
	Sideswipe	All				15	32				
Widen lane (add 4 ft to both sides)	Head-on	All				15	40				
	ROR	All				15	40				
	Sideswipe	All				15	40				
Widen lane (initially less than 9 ft)	All	Fatal/ Injury	Rural	2-lane	400-2,000	38	28		5	50	
Widen lane (initially between 9 ft and 10.75 ft)	All	Fatal/ Injury	Rural	2-lane	400-2,000	38	16		2	30	
Widen lanes	All	All	All			15	56				
	All	All	Rural			21	100(1-((AMFRA-1.0)PRA+1.0)); AMFRA=accident modification factor for related accidents (for values of AMFRA, refer to source), PRA=proportion of total crashes constituted by related crashes.				Expert Panel
	All	All				15	50				
	Fixed object	All				15	5				
	Head-on	All				15	70				
	Head-on	All				15	5				
	Head-on	All				15	70				
	ROR	All				15	49				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Widen lanes (cont'd)	Overturn	All				15	5				
	Sideswipe	All				15	52				
	Sideswipe	All				15	5				
	Sideswipe	All				15	52				
Widen shoulder (from 6 to 7 ft)	All	All	Rural	2-lane		20	-1	4			
Widen shoulder (from 6 to 8 ft)	All	All	Rural	2-lane		20	4	2			
Widen shoulder (from 6 to 9 ft)	All	All	Rural	2-lane		20	21	6			
Widen shoulder (from 6 to >9 ft)	All	All	Rural	2-lane		20	18	3			
Widen shoulder	All	All	All	All		1	20				
Widen shoulder (initially less than 1 ft)	All	Fatal/ Injury	Rural	2-lane	400-2,000	38	25		9	40	
Widen shoulder (initially between 1 ft and 3.3 ft)	All	Fatal/ Injury	Rural	2-lane	400-2,000	38	13		6	20	
Widen shoulder (initially less than or equal to 4 ft)	All	All	All	All		1	20				
Widen shoulder (initially more than 4 ft)	All	All	All	All		1	35				
Widen shoulder (paved)	All	All				15	29				
	All	All				15	57				
	All	All				15	20				
	All	All				15	8				
	All	All				15	32				
	All	All				15	50				
	Fixed object	All				15	15				
	Head-on	All				15	45				
	Head-on	All				15	75				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Widen shoulder (paved) (cont'd)	Head-on	All				15	15				
	ROR	All				15	60				
	Ped	All				15	71				
	Sideswipe	All				15	28				
	Sideswipe	All				15	41				
	Sideswipe	All				15	15				
Widen shoulder (paved) (from 0 to 2 ft)	Fixed object	All				15	16				
	ROR	All				15	16				
Widen shoulder (paved) (from 0 to 4 ft)	Fixed object	All				15	29				
	ROR	All				15	29				
Widen shoulder (paved) (from 0 to 6 ft)	Fixed object	All				15	40				
	ROR	All				15	40				
Widen shoulder (paved) (from 0 to 8 ft)	Fixed object	All				15	49				
	ROR	All				15	49				
Widen shoulder (unpaved)	All	All	Rural	2-lane		15	15				
	All	All				15	22				
Widen shoulder (unpaved) (from 0 to 2 ft)	Fixed object	All				15	13				
	ROR	All				15	13				
Widen shoulder (unpaved) (from 0 to 4 ft)	Fixed object	All				15	25				
	ROR	All				15	25				
Widen shoulder (unpaved) (from 0 to 6 ft)	Fixed object	All				15	34				
	ROR	All				15	34				
Widen shoulder (unpaved) (from 0 to 8 ft)	Fixed object	All				15	43				
	ROR	All				15	43				

Table 7: Median Countermeasures

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
MEDIAN COUNTERMEASURES											
Install median	All	All	All	All		1	15				
	All	Fatal/ Injury	Rural	2-lane		5	-94	56			Meta Analysis
	All	Fatal/ Injury	Urban	2-lane		5	39	10			Meta Analysis
	All	Injury	Rural	Multilane		5	12	3			Meta Analysis
	All	Injury	Urban	Multilane		5	22	2			Meta Analysis
	All	PDO	Rural	Multilane		5	18	3			Meta Analysis
	All	PDO	Rural	2-lane		5	-128	55			Meta Analysis
	All	PDO	Urban	Multilane		5	-9	2			Meta Analysis
Install median (flush)	All	All			<5,000/lane	15	44				
	All	All			>5,000/lane	15	52				
	All	All	All	All		1	25				
	All	All				15	15				
	All	All				15	15				
	All	Fatal				15	90				
	Left-turn	All			<5,000/lane	15	72				
	Left-turn	All			>5,000/lane	15	78				
Install median barrier	All	All	All	All		27	**86**	3			EB Before-After
	All	All		Multilane divided		5	-24	3			Meta Analysis
	All	All				15	19				
	All	All	All	All		1	5				
	All	All				15	5				
	All	All				15	15				
	All	All				15	19				
	All	All				15	20				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Install median barrier (cont'd)	All	All				15	25				
	All	All				15	25				
	All	All				15	36				
	All	Fatal		Multilane divided		5	43	10			Meta Analysis
	All	Fatal	All	All		1	65				
	All	Fatal				15	65				
	All	Fatal/ Injury	All	All		27	**88**	5			EB Before-After
	All	Injury		Multilane divided		5	30	6			Meta Analysis
	All	Injury	All	All		1	40				
	All	Injury				15	40				
	ROR	All				15	35				
	Right-angle	All			<5,000/lane	15	58				
	Right-angle	All			>5,000/lane	15	54				
Install median barrier (cable)	All	All		Highway (three-lane)		5	-34	74			Meta Analysis
	All	Fatal		Highway (three-lane)		5	100	254			Meta Analysis
	All	Injury		Highway (three-lane)		5	26	84			Meta Analysis
	All	Injury		Multilane divided		5	29	11			Meta Analysis
	Head-on	Fatal	Rural	Highway		9	92				Simple Before-After
Install median barrier (concrete)	All	Fatal				15	90				
	All	Injury		Multilane divided		5	-15	36			Meta Analysis
	All	Injury				15	10				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Install median barrier (steel)	All	Injury		Multilane divided		5	35	8			Meta Analysis
Install or upgrade median barrier near gore area	All	All			<5,000/lane	15	17				
	All	All			>5,000/lane	15	17				
	All	All				15	17				
	ROR	All			<5,000/lane	15	56				
	ROR	All			>5,000/lane	15	56				
	ROR	All				15	56				
	Rear-end	All			<5,000/lane	15	39				
	Rear-end	All			>5,000/lane	15	39				
	Rear-end	All				15	39				
Install raised median	All	All				15	20				
	All	All				15	25				
	Head-on	All				15	75				
	Ped	All				15	25				
Vary median width	All	All	Urban	Urban Street		6	100(1-((b0(EXP(b1Wm^b2)-1.0)+1.0)/(b0(EXP(b1x16b^b2)-1.0)+1.0))); b0, b1, and b2=regression coefficients (for values of b0, b1, and b2, refer to source), Wm=median width (ft).				
	All	All	Rural	Rural Highway		6	100(1-((b0(EXP(b1Wm^b2)-1.0)+1.0)/(b0(EXP(b1Wmb^b2)-1.0)+1.0))); b0, b1, and b2=regression coefficients (for values of b0, b1, and b2, refer to source), Wm=median width (ft), Wmb=base median width (ft) (16 for surfaced median, 76 for depressed median).				
	All	All		Freeway		6	100(1-((b0(EXP(b1Wm^b2)-1.0)+1.0)/(b0(EXP(b1Wmb^b2)-1.0)+1.0))); b0, b1, and b2=regression coefficients (for values of b0, b1, and b2, refer to source), Wm=median width (ft), Wmb=base median width (ft) (24 for surfaced median, 76 for depressed median).				

Table 8: Roadside Countermeasures

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
ROADSIDE COUNTERMEASURES											
Install frontage road	All	All				15	40				
	All	All	All	All		1	40				
Install snow fencing	Snow	All				15	53				
	Snow	All				15	71				
	Snow	All				15	35				
Remove poles by burying utility lines	All	All				15	40				
Remove obstacles on curves to improve sight distance	All	Fatal/ Injury	Rural	2-lane		38	5				
Remove or relocate fixed objects outside of clear zone	All	All	All	All		27	**38**	10			EB Before-After
	All	All			<5,000/lane	15	18				
	All	All			>5,000/lane	15	17				
	All	All	All	All		1	30				
	All	All	All	All		1	25				
	All	All				15	29				
	All	All				15	35				
	All	All				15	61				
	All	All				15	20				
	All	All				15	25				
	All	All				15	30				
	All	All				15	30				
	All	All				15	55				
	All	All				15	25				
	All	Fatal	All	All		1	50				
	All	Fatal	All	All		1	40				
	All	Fatal				15	40				
	All	Fatal				15	50				
	All	Fatal				15	40				
	All	Fatal				15	50				
	All	Fatal/ Injury	All	All		27	**38**	13			EB Before-After
	All	Injury	All	All		1	30				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Remove or relocate fixed objects outside of clear zone (cont'd)	All	Injury	All	All		1	25				
	All	Injury				15	25				
	All	Injury				15	30				
	All	Injury				15	25				
	All	Injury				15	30				
	Fixed object	All				15	65				
	Fixed object	All	Urban			15	20				
	Fixed object	All			<400	15	40				
	Fixed object	All				15	88				
	Fixed object	All				15	90				
	Fixed object	All				15	100				
	Fixed object	All				15	75				
	ROR	All				15	71				
	Overturn	All			<5,000/lane	15	42				
	Overturn	All			>5,000/lane	15	44				
Vary horizontal clearance	All	All	Rural	Rural Highway		6	100(1-((EXP(-0.0137(Whc-30))-1.0)Ps+1.0)); Whc=horizontal clearance (average for length of segment, ft), Ps=proportion of crash type subset (for values of Ps, refer to source).				
Vary utility pole density	All	All		Freeway		6	100(1-((fp-1.0)Ps+1.0)); fp=((0.0000984ADT+0.0354Dp)Wo^-0.6-0.04)/(0.0000128ADT+0.075); Dp=utility pole density (two-way total) (pole/mi), Wo =average pole offset from nearest edge of traveled way (ft), Ps=proportion of crash type subset (for values of Ps, refer to source).				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Vary utility pole density (cont'd)	All	All	Rural	Rural Highway		6	100(1-((fp-1.0)Ps+1.0)); fp=((0.0000984ADT+0.0354Dp)Wo^-0.6-0.04)/(0.0000128ADT+0.075); Dp=utility pole density (two-way total) (pole/mi), Wo =average pole offset from nearest edge of traveled way (ft), Ps=proportion of crash type subset (for values of Ps, refer to source)				
	All	All	Urban	Urban Street		6	100(1-(0.022(fp-1.0)+1.0)), fp=((0.0000984ADT+0.0354Dp)Wo^-0.6-0.04)/(0.0000649ADT+1.128); Dp=utility pole density (two-way total) (poles/mi), Wo=average pole offset from nearest edge of traveled way (ft)				
Widen clear zone (add 5 ft)	Fixed object	All				15	13				
Widen clear zone (add 8 ft)	Fixed object	All				15	21				
Widen clear zone (add 10 ft)	Fixed object	All				15	25				
Widen clear zone (add 15 ft)	Fixed object	All				15	35				
Widen clear zone (add 20 ft)	Fixed object	All				15	44				

Table 9: Signs / Markings / Operational Countermeasures

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Std Error	Range: Low	Range: High	Study Type
SIGNS											
Implement sign corrections to MUTCD standards	All	Injury	Urban	Local		5	15	10			Meta Analysis
	All	PDO	Urban	Local		5	**7**	6			Meta Analysis
Install chevron signs on horizontal curves	All	Fatal/ Injury	Rural	2-lane		38	20				
	All	All				15	35				
	All	All	Urban	Arterial (urban)		5	64	49			Simple Before-After
	All	All				15	20				
	All	All				15	35				
	All	All				15	50				
Install curve advance warning signs	All	Fatal/ Injury	Rural	2-lane		38	10				
	All	Injury				5	30	71			Meta Analysis
	All	PDO				5	8	76			Meta Analysis
	All	All				15	30				
	All	Fatal				15	55				
	All	All				15	30				
	All	All				15	23				
	All	Injury				15	20				
	Head-on	All				15	29				
	ROR	All				15	30				
	ROR	All	All	All		1	30				
Install curve advance warning signs (advisory speed)	All	Injury				5	13	9			Meta Analysis
	All	PDO				5	29	23			Meta Analysis
	All	All				15	29				
	All	All				15	20				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Install curve advance warning signs (flashing beacon)	All	All				15	30				
Install delineators (general)	All	All				15	11				
	Head-on	All				15	67				
	Night	All				15	25				
	ROR	All				15	34				
	Sideswipe	All				15	67				
Install dynamic/variable accident warning signs	All	Injury		Freeways		5	44	17			Meta Analysis
	Rear-end	Injury		Freeways		5	16	10			Meta Analysis
Install dynamic/variable queue warning signs	Rear-end	PDO		Freeways		5	-16	15			Meta Analysis
Install dynamic/variable speed warning signs	All	All				5	46	17			Meta Analysis
	All	Injury				5	41	62			Meta Analysis
Install guide signs (general)	All	All	All			15	15				
Install guideposts or barrier reflectors	All	Fatal/ Injury	Rural	2-lane		38	8				
Install illuminated signs	All	All				15	15				
Install lane assignment signs	Rear-end	All				15	10				
	Sideswipe	All				15	20				
Install nonvehicular (animal) reflectors	All	All				15	10				
	Night	All				15	25				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Std Error	Range: Low	Range: High	Study Type
Install pavement condition warning signs	All	All				15	5				
	Wet pavement	All				15	20				
	Wet pavement	All				15	20				
	Wet weather	All	All	All		1	20				
Install post-mounted delineators (curves)	All	All				15	25				
	All	All				15	20				
	All	All				15	25				
	All	All				15	30				
	Night	All	All	All		1	30				
Install post-mounted delineators (tangents and curves combined)	All	Injury	Rural	2-lane		5	-4	10			Meta Analysis
	All	PDO	Rural	2-lane		5	-5	7			Meta Analysis
	All	All				15	25				
PAVEMENT											
Improve pavement friction	All	All				15	13				
	Ped	All				15	10				
Improve pavement friction (groove shoulder)	All	All				15	22				
	All	All	All	All		1	25				
	All	All				15	18				
	All	All				15	25				
	All	All				15	25				
	All	Fatal/ Injury				15	18				
	All	PDO				15	17				
	ROR	All				15	27				
	ROR	All				15	27				
Improve pavement friction (grooving)	All	All				15	21				
	All	All			<5,000/lane	15	37				
	All	All			>5,000/lane	15	21				
	All	All	All	All		1	25				
	All	All				15	10				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Improve pavement friction (grooving) (cont'd)	All	All				15	14				
	All	All				15	25				
	Fixed object	All			<5,000/lane	15	36				
	Fixed object	All			>5,000/lane	15	19				
	ROR	All			<5,000/lane	15	41				
	ROR	All			>5,000/lane	15	40				
	Overturn	All			<5,000/lane	15	54				
	Overturn	All			>5,000/lane	15	35				
	Rear-end	All			<5,000/lane	15	54				
	Rear-end	All			>5,000/lane	15	35				
	Wet pavement	All				15	60				
	Wet pavement	All			<5,000/lane	15	64				
	Wet pavement	All			>5,000/lane	15	54				
	Wet pavement	All	All	All		1	60				
Improve pavement friction (increase skid resistance)	Wet pavement	All	All	All		1	45				
	Wet pavement	Fatal/ Injury	Rural	2-lane		38	30				
Improve pavement friction (overlay)	All	All			<5,000/lane	15	13				
	All	All			>5,000/lane	15	20				
	Fixed object	All			<5,000/lane	15	43				
	Fixed object	All			>5,000/lane	15	34				
	Head-on	All			<5,000/lane	15	43				
	Head-on	All			>5,000/lane	15	61				
	Head-on	Fatal/ Injury				15	19				
	Head-on	PDO				15	30				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Improve pavement friction (overlay) (cont'd)	Left-turn	Fatal/ Injury				15	41				
	Left-turn	PDO				15	34				
	ROR	Fatal/ Injury				15	28				
	ROR	PDO				15	29				
	Rear-end	Fatal/ Injury				15	12				
	Rear-end	PDO				15	21				
	Right-angle	All				15	23				
	Right-angle	Fatal/ Injury				15	11				
	Right-angle	PDO				15	31				
	Sideswipe	All			<5,000/lane	15	43				
	Sideswipe	All			>5,000/lane	15	61				
	Sideswipe	Fatal/ Injury				15	12				
	Sideswipe	PDO				15	27				
	Wet pavement	All			<5,000/lane	15	23				
	Wet pavement	All			>5,000/lane	15	50				
Improve pavement friction (curve overlay)	All	All				15	17				
	All	All				15	10				
	All	All				15	24				
	Head-on	All				15	86				
	Wet pavement	All				15	51				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Improve pavement friction (resurface with deicing additives)	Head-on	All				15	31				
Improve pavement friction (resurface with open-graded mix)	All	All				15	75				
	Fixed object	All				15	93				
	Head-on	All				15	90				
	Sideswipe	All				15	90				
	Wet pavement	All				15	91				
Improve pavement friction (skid treatment with overlay)	Ped	Fatal/ Injury				15	3				
Install centerline rumble strips	All	All	Rural	2-lane	5,000-22,000	5	**14**	5			EB Before-After
	All	Injury	Rural	2-lane	5,000-22,000	5	**15**	8			EB Before-After
	Head-on	All	Rural	2-lane highway		26	55				Simple Before-After
	Head-on	Fatal	Rural	2-lane highway		26	68				Simple Before-After
	Head-on	Injury (minor)	Rural	2-lane highway		26	26				Simple Before-After
	Head-on	Injury (major)	Rural	2-lane highway		26	33				Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range Low	Range High	
Install centerline rumble strips (cont'd)	Head-on/ Sideswipe	All	Rural	2-lane	5,000-22,000	5	21	12			EB Before-After
	Head-on/ Sideswipe	Injury	Rural	2-lane	5,000-22,000	5	25	15			EB Before-After
Install or upgrade curbing	Fixed object	All				15	50				
Install shoulder rumble strips	All	All	Rural	Multilane divided		8	16				Simple Before-After
	All	Injury	Rural	Multilane divided		8	17				Simple Before-After
	ROR	All	Rural	2-lane	>4,000	41	13	8			
	ROR	All	Rural	Multilane divided		8	10				Simple Before-After
	ROR	All	Rural	Highway		16	27	22	22	33	
	ROR	All	All	Freeway		19	18	7			Comparison Group Before-After
	ROR	All	Rural	Freeway		19	21	10			Comparison Group Before-After
	ROR	All	Rural	All		57	34				
	ROR	All	Rural	Arterial		57	16				
	ROR	All	Rural	Between ramps		57	34				
	ROR	All	Rural	Highway		57	38				
	ROR	All	Rural	Three-lane		57	36				
	ROR	All	Rural	2-lane		57	32				
	ROR	Fatal/ Injury	Rural	2-lane	>4,000	41	18	12			
	ROR	Injury	Rural	Multilane divided		8	22				Simple Before-After
	ROR	Injury	All	Freeway		19	13	12			Comparison Group Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Install shoulder rumble strips (cont'd)	ROR	Injury	Rural	Freeway		19	7	16			Comparison Group Before-After
Install shoulder rumble strips on illuminated highways	ROR	All	Rural	All		57	41				
Install shoulder rumble strips on unilluminated highways	ROR	All	Rural	All		57	31				
Pave shoulder	All	All				15	15				
	Head-on	All				15	86				
	Night	All				15	62				
Vary centerline rumble strip width	All	All	Rural	Rural Highway		6	12	6			
Vary shoulder rumble strips	All	All	Rural	Rural Highway		6	100(1-(-0.07Pi+1.0)); Pi=proportion of crash type subset (for values of Pi, refer to source).				
	All	All		Freeway		6	100(1-(-0.12Pi+1.0)); Pi=proportion of influential crashes that occur on roadway type i				
MARKINGS											
Delineate multiple lanes (painted lane lines)	All	All	Urban	Multilane		13	18	22			Meta Analysis
Install centerline markings	All	All				15	33				
	All	All	All	All		1	36				
	All	All				15	35				
	All	All				15	30				
	All	Injury	All	2-lane		13	1	6			Meta Analysis
	All	PDO	All	2-lane		13	-1	5			Meta Analysis
Install chevron converging pattern markings on pavement	All	All	Urban			18	38	6			Simple Before-After
	All	Injury		Freeways		5	56	26			Meta Analysis

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
Install edgelines and centerlines	All	All	Rural	Undivided	1,000-4,000	2	-3	21			EB Before-After
	All	Injury	All	All		13	**24**	11			Meta Analysis
Install edgelines, centerlines and delineators	All	Injury	All	All		13	**45**	11			Meta Analysis
Install edgeline markings	All	All			<5,000/lane	15	44				
	All	All			>5,000/lane	15	38				
	All	All	All	All		1	20				
	All	All				15	24				
	All	All				15	30				
	All	All				15	4				
	All	All				15	15				
	All	All				15	15				
	All	All				15	25				
	All	Injury				15	15				
	All	PDO				15	8				
	Fixed object	All			<5,000/lane	15	66				
	Fixed object	All			>5,000/lane	15	59				
	ROR	All				15	30				
	ROR	All	All	All		1	25				
	Overturn	All			<5,000/lane	15	45				
	Overturn	All			>5,000/lane	15	50				
	Rear-end	All			<5,000/lane	15	45				
	Rear-end	All			>5,000/lane	15	50				
Install edgeline markings (from 4 to 6 in)	All	Injury	Rural	2-lane		13	3	4			Meta Analysis
	All	PDO	Rural	2-lane		13	3	11			Meta Analysis
Install edgeline markings (8 in)	All	Injury	Rural	2-lane		13	-5	8			Meta Analysis
	All	PDO	Rural	2-lane		13	1	15			Meta Analysis

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Install raised pavement markers (snowplowable) where DOC = Degree of Curvature	Night	All	Rural	4-lane freeway	≤20000	4	-13	14			EB Before-After
	Night	All	Rural	4-lane freeway	<60000	4	33	21			EB Before-After
	Night	All	Rural	4-lane freeway	20,001-60,000	4	6	21			EB Before-After
	Night	All	Rural	2-lane, DOC>3.5	≤5,000	4	**-43**	9			EB Before-After
	Night	All	Rural	2-lane, DOC>3.5	5,001-15,000	4	**-26**	10			EB Before-After
	Night	All	Rural	2-lane, DOC>3.5	15,001-20,000	4	-3	11			EB Before-After
	Night	All	Rural	2-lane, DOC<3.5	≤5,000	4	**-16**	3			EB Before-After
	Night	All	Rural	2-lane, DOC<3.5	5,001-15,000	4	**1**	5			EB Before-After
	Night	All	Rural	2-lane, DOC<3.5	15,001-20,000	4	**24**	7			EB Before-After
REGULATORY											
Install no-passing line	All	All				15	53				
	Head-on	All				15	40				
	Sideswipe	All				15	40				
Lower posted speed	All	All	All	All		40	-7				Paired comparison
	Fatal/injury	All	All	All		40	-5				Paired comparison
Lower posted speed by 5 mph	All	All	All	All		40	-44				Paired comparison
Lower posted speed by 10 mph	All	All	All	All		40	7				Paired comparison
Lower posted speed by 15-20 mph	All	All	All	All		40	5				Paired comparison

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Std Error	Range Low	Range High	Study Type
Prohibit on-street parking	All	All	Urban	Arterial (64ft)	30,000	5	42	8			Simple Before-After
	All	All				15	22				
	All	All				15	8				
	All	All				15	35				
	All	Injury	Urban	Arterial		5	20	5			Meta Analysis
	All	Injury	Urban	Arterial (64ft)	30,000	5	35	14			Simple Before-After
	All	PDO	Urban	Arterial		5	27	2			Meta Analysis
	All	PDO	Urban	Arterial (64ft)	30,000	5	48	1			Simple Before-After
	Fixed object	All				15	40				
Raise posted speed	All	All	All	All		40	11				Paired comparison
	Fatal/injury	All	All	All		40	7				Paired comparison
Raise posted speed by 5 mph	All	All	All	All		40	8				Simple Before-After
Raise posted speed by 10-15 mph	All	All	All	All		40	15				Simple Before-After
Reduce mean speed by 5% through speed limit change and enforcement	All	Fatal	All	All		5	17	5			Meta analysis
	All	Injury	All	All		5	7	3			Meta analysis
	All	PDO	All	All		5	5	4			Meta analysis
Reduce mean speed by 10% through speed limit change and enforcement	All	Fatal	All	All		5	32	9			Meta analysis
	All	Injury	All	All		5	15	5			Meta analysis
	All	PDO	All	All		5	10	8			Meta analysis
Reduce mean speed by 15% through speed limit change and enforcement	All	Fatal	All	All		5	44	14			Meta analysis
	All	Injury	All	All		5	22	8			Meta analysis
	All	PDO	All	All		5	15	12			Meta analysis

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Vary curb parking extent	All	All	Urban	Urban Street		6	100(1-(1+Ppk(Bpk-1))), Bpk=(1.10+0.365Iu2+0.609Pb/o)((fap/pp-1.0)Pap+1.0); Ppk=proportion of street segment length with parallel or angle parking (=0.5 Lpk/L), Lpk=curb miles allocated to parking (mi), Iu2=indicator variable for cross section(1 for two-lane street; 0 otherwise), Pb/o=for that part of the street with parking, the proportion that has business or office as an adjacent land use, fap/pp=ratio of crashes on streets with angle parking to those on streets with parallel parking, Pap= for that part of the street with parking, the proportion with angle parking				
Vary speed limit	All	All		Freeway		6	100(1-EXP(-0.012(V-55))); V=speed limit (mph)				
	All	All	Urban	Urban Street		6	100(1-((EXP(0.252IV<=30+0.318IV>=45)Poff-road+1.15((V^2.066)(Exp(-0.0689V)))(1-Poff-road)))); Poff-road=proportion of crashes that occur off the roadway, for values of IV<=30 and IV>=45, refer to source; 100(1-(EXP(b(V-40)))); b= vary per roadway type, V=Speed limit (mph).				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
LIGHTING											
Improve lighting	All	All	All	All		1	25				
	All	All				15	23				
	All	All				15	20				
	All	All				15	25				
	All	Fatal	All	Freeway		5	73	71			Meta Analysis
	All	Fatal	All	Highway		5	69	36			Meta Analysis
	All	Fatal	Rural	Highway		5	73	72			Meta Analysis
	All	Fatal	Urban	Highway		5	63	52			Meta Analysis
	All	Injury	All	Freeway		5	27	12			Meta Analysis
	All	Injury	All	Highway		5	28	6			Meta Analysis
	All	Injury	Rural	Highway		5	20	12			Meta Analysis
	All	Injury	Urban	Highway		5	31	7			Meta Analysis
	All	PDO	All	Freeway		5	32	26			Meta Analysis
	All	PDO	All	Highway		5	18	7			Meta Analysis
	All	PDO	Rural	Highway		5	30	43			Meta Analysis
	All	PDO	Urban	Highway		5	16	8			Meta Analysis
	Night	All				15	37				
	Night	All				15	20				
	Night	All				15	45				
	Night	All				15	45				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Std Error	Range: Low	Range: High	Study Type
Install lighting at interchanges	All	All	All	All		27	**50**	17			EB Before-After
	All	Fatal/ Injury	All	All		27	26	38			EB Before-After
OPERATIONAL											
Add two-way left-turn lane	All	All		All		27	8	16			EB Before-After
	All	All		All		1	34		25	45	
	All	All				15	30				Simple Before-After
	All	All				15	25				Simple Before-After
	All	All				15	35				Cross-section
	All	All				15	34				Simple Before-After
	All	All				15	25				Simple Before-After
	All	Fatal/ Injury		All		27	20	25			EB Before-After
	All	Injury				15	20				Cross-section
	All	PDO				15	35				Cross-section
	Head-on	All				15	36				
	Head-on	Fatal/ Injury				15	67				Simple Before-After
	Head-on	PDO				15	64				Simple Before-After
	Left-turn	All				15	33				
	Left-turn	All				15	33				Simple Before-After
	Left-turn	Fatal/ Injury				15	17				Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Add two-way left-turn lane (cont'd)	Left-turn	PDO				15	38				Simple Before-After
	ROR	All				15	37				
	ROR	Fatal/ Injury				15	90				Simple Before-After
	ROR	PDO				15	16				Simple Before-After
	Ped	All				15	19				
	Rear-end	All				15	36				
	Rear-end	All				15	36				Simple Before-After
	Rear-end	All				15	36				Cross-section
	Rear-end	Fatal/ Injury				15	32				Simple Before-After
	Rear-end	PDO				15	38				Simple Before-After
	Right-angle	All				15	20				Simple Before-After
	Right-angle	Fatal/ Injury				15	31				Simple Before-After
	Right-angle	PDO				15	23				Simple Before-After
	Sideswipe	Fatal/ Injury				15	32				Simple Before-After
	Sideswipe	PDO				15	37				Simple Before-After
Convert from two-way to one-way traffic	All	All				15	43				
	All	All	All	All		1	33				
Implement crossover at work zone	All	All		4-lane divided	6,800-38,000	12	0				Simple Before-After

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Implement maintenance and bituminous overlay	Head-on	All				15	31				
	Left-turn	Fatal/ Injury				15	37				
	Left-turn	PDO				15	13				
	ROR	Fatal/ Injury				15	19				
	ROR	PDO				15	30				
	Ped	Fatal/ Injury				15	33				
	Ped	PDO				15	42				
	Rear-end	Fatal/ Injury				15	21				
	Right-angle	Fatal/ Injury				15	16				
	Right-angle	PDO				15	23				
	Sideswipe	PDO				15	29				
Implement single lane closure at work zone	All	All		4-lane divided	20,000-41,500	12	-56				Simple Before-After
Improve drainage patterns	All	All				15	32				
	All	All	All	All		1	20				
	All	All				15	20				
	Wet pavement	All				15	40				
Install sidewalk	Ped	All				15	74				
	Ped	All				15	75				
	Ped	All				15	89				
	Ped	All				15	65				
	Ped	All				15	65				

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness				Study Type
							Crash Reduction Factor / Function	Std Error	Range		
									Low	High	
Reconfigure lanes within existing pavement width (two to three in one direction)	All	All		2-lane		15	32				
	All	Injury		2-lane		15	59				
	Left-turn	All		2-lane		15	46				
	Rear-end	All		2-lane		15	46				
	Sideswipe	All		2-lane		15	46				
Reconfigure lanes within existing pavement width (four to five in one direction)	All	All	Urban	Freeway	77,000-126,000	5	**-11**	5			EB Before-After
	All	Fatal/ Injury	Urban	Freeway	77,000-126,000	5	-11	8			EB Before-After
	All	Fatal/ Injury/ PDO	Urban	Freeway	77,000-126,000	5	**-10**	7			EB Before-After
Reconfigure lanes within existing pavement width (five to six in one direction)	All	All	Urban	Freeway	77,000-126,000	5	**-3**	8			EB Before-After
	All	Fatal/ Injury	Urban	Freeway	77,000-126,000	5	-7	13			EB Before-After
	All	Fatal/ Injury/ PDO	Urban	Freeway	77,000-126,000	5	-4	11			EB Before-After
Reduce driveway density (general)	All	All	Urban	Urban Street		6	100(1-(EXP(0.008(Dd,b/o-50)))); Dd,b/o = density of driveways serving business of office land uses (driveways/mi)				
Remove unwarranted signals (one-way streets)	Ped	All				46	17				Comparison Group Before-After
Vary passing lanes	All	All	Rural	Rural Highway		6	0.25 for one direction with three lane; 0.35 for two direction with four lane				
Vary truck presence	All	All	Urban	Urban Street		6	100(1-((ftk-1.0)(1-Poff-road)+1.0)), ftk=(2EXP(-0.059Pt)+0.017Pt)/1.506; Poff-road=proportion of crashes that occur off the roadway, Pt=percent of truck presence; 100(1-(1.0+Truck/Basei)), for values of Truck and Basei, refer to source.				

Tables for Pedestrian Crash Reduction Factors

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Table 10: Signalization Countermeasures

Countermeasures	Crash Type	Crash Severity	Area Type	Ref	Obs	Effectiveness				
						Crash Reduction Factor / Function	Std Error	Range		Study Type
								Low	High	
SIGNALIZATION COUNTERMEASURES										
Add exclusive pedestrian phasing	Pedestrian	All		28		34		7	60	
Improve signal timing [to intervals specified by the ITE *Determing Vehicle Change Intervals: A Proposed Recommended Practice (1985)]*	All	Fatal/Injury		49		12	9			Experimental Design (Case-Control Study)
	Pedestrian	Fatal/Injury		49		37				Experimental Design (Case-Control Study)
Install pedestrian countdown signal heads	Pedestrian	Fatal/Injury	Urban (San Francisco)	32		25				
Install pedestrian signal	All	All		15		20				
	Pedestrian	All		15		53				
	Pedestrian	All		5		0				
	All	All		15		25				
	All	All		15		15				
	Pedestrian	All		15		55				
	Pedestrian	All		15		50				
Modify signal phasing (implement a leading pedestrian interval)	Pedestrian	All		28		5				
Remove unwarranted signals (one-way street)	Pedestrian	All		46		17				Comparison Group Before-After

Table 11: Geometric Countermeasures

Countermeasures	Crash Type	Crash Severity	Area Type	Ref	Obs	Effectiveness: Crash Reduction Factor / Function	Std Error	Range: Low	Range: High	Study Type
GEOMETRIC COUNTERMEASURES										
Convert unsignalized intersection to roundabout	Pedestrian	Fatal/Injury	Urban	11		**27**	12	44	3	
Convert intersection to roundabout	Pedestrian	All		55		89				
Install pedestrian overpass/underpass	Pedestrian	All		15		86				
	Pedestrian	All		1	14	90		60	95	
	Pedestrian	Fatal/Injury		15		90				
	Pedestrian	PDO		15		90				
	Pedestrian	All		15		100				
	Pedestrian	All		15		67				
	Pedestrian	All		15		5				
	Pedestrian	All		15		90				
Install pedestrian overpass/underpass (unsignalized intersection)	Pedestrian	All		28		13				
Install raised median	Pedestrian	All		15		25				
Install raised median (marked crosswalk)	Pedestrian	All		60		46				
Install raised median (unmarked crosswalk)	Pedestrian	All		60		39				
Install raised median (unsignalized intersection)	Pedestrian	All		28		69				
Install raised pedestrian crossing	All	All		5		30	67			Meta-analysis
	All	Fatal/Injury		5		36	54			Meta-analysis
	Pedestrian	All		28		8				
Install refuge islands	Pedestrian	All		28		56				
Install sidewalk (to avoid walking along roadway)	Pedestrian	All		15		74				
	Pedestrian	All		36		88		43	99	Case-Control Study

Countermeasures	Crash Type	Crash Severity	Area Type	Ref	Obs	Effectiveness				
						Crash Reduction Factor / Function	Std Error	Range		Study Type
								Low	High	
Install sidewalk (to avoid walking along roadway) (cont'd)	Pedestrian	All		15		75				
	Pedestrian	All		15		89				
	Pedestrian	All		15		65				
	Pedestrian	All		15		65				
Provide shoulder (paved)	Pedestrian	All		15		71				

Table 12: Signs / Markings / Operational Countermeasures

Countermeasures	Crash Type	Crash Severity	Area Type	Ref	Obs	Effectiveness				
						Crash Reduction Factor / Function	Std Error	Range		Study Type
								Low	High	
SIGNS / MARKINGS / OPERATIONAL COUNTERMEASURES										
Convert two-way to all-way STOP control	Pedestrian	All		15		39				
	Pedestrian	All		21	69	19				Before-After with Likelihood Functions
	Pedestrian	All	Urban	30		39				Simple Before-After
Improve lighting at intersections	Pedestrian	Fatal		13		78	87			Meta-analysis
	Pedestrian	Injury		13		**42**	18			Meta-analysis
Improve pavement friction	Pedestrian	All		15		10				
Improve pavement friction (skid treatment with overlay)	Pedestrian	Fatal/Injury		15		3				
Increase enforcement to reduce speed	Pedestrian	All		28		70				
Install far-side bus stops (signalized intersection)	Pedestrian	All		28		1				
Install object markers	Pedestrian	All		15		29				
Install school zone warning signs	All	All		15		18				
	All	All		15		15				
	All	All		15		20				
	All	All		15		15				
	All	All		15		20				

Countermeasures	Crash Type	Crash Severity	Area Type	Ref	Obs	Effectiveness				
						Crash Reduction Factor / Function	Std Error	Range		Study Type
								Low	High	
Permit right-turn-on-red	Pedestrian	All	New Orleans	5		-81	88			Simple Before-After
	Pedestrian	All	New York	5		-43	24			Simple Before-After
	Pedestrian	All	Ohio	5		-57	31			Simple Before-After
	Pedestrian	All	Wisconsin	5		-108	51			Simple Before-After
Prohibit left-turns	Pedestrian	All		15		10				
Remove marked unprotected crosswalks from arterial intersections	Pedestrian	All	Urban	5		73				
Restrict parking near intersections (to off-street)	Pedestrian	All		15		30				

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Federal Highway Administration
Office of Safety
1200 New Jersey Avenue, SE
Washington, D.C. 20590
Web site: http//safety.fhwa.gov

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HSIP/HRRRP Application Process

Local Agency Highway Safety Improvement Program Workshop
December 4 & 6, 2007
Orland Park & Collinsville, IL

Jim Allen, P.E.
Safety Implementation Engineer
IDOT Bureau Safety Engineering
Springfield, IL

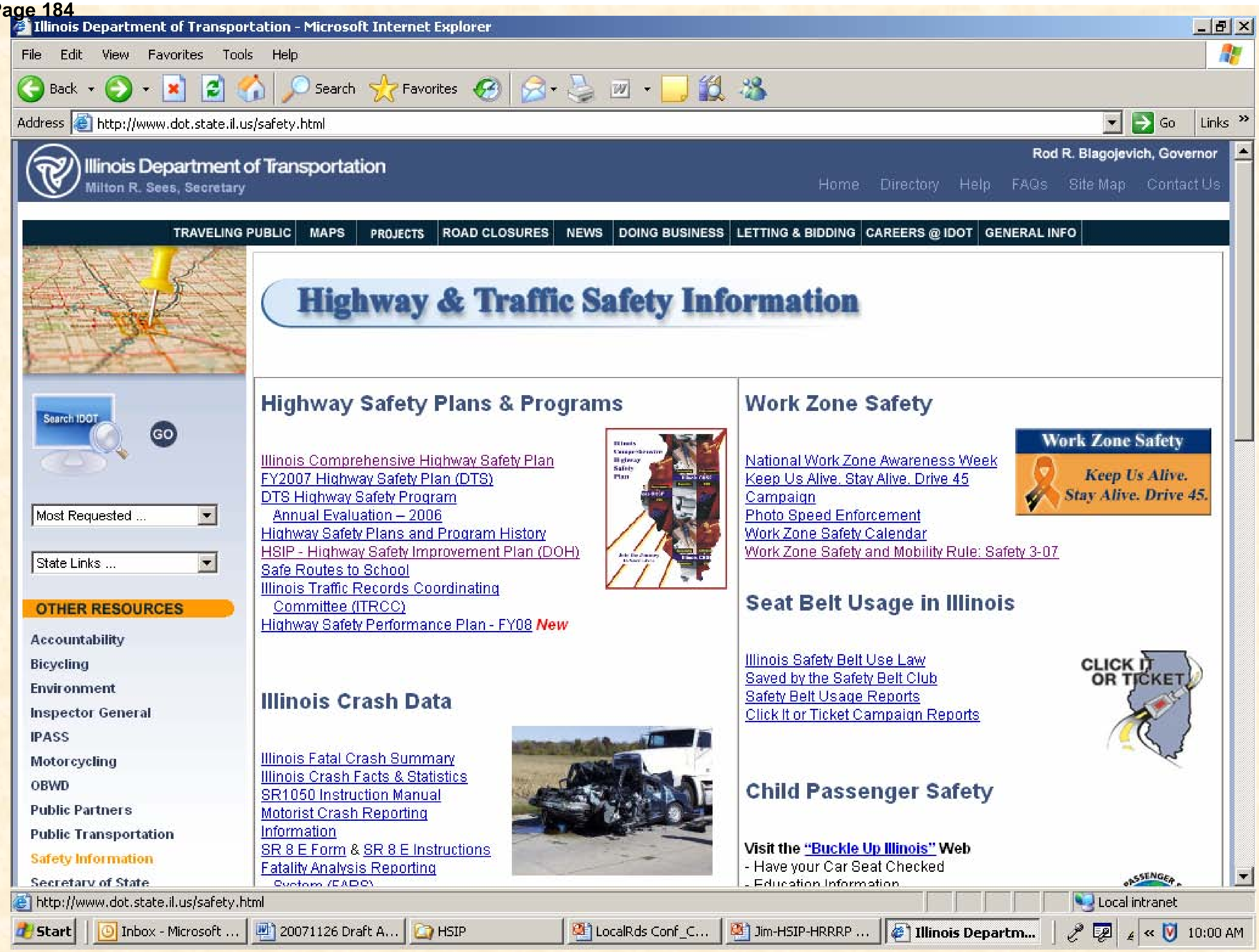
James.P.Allen@illinois.gov
Ph: 217.558.1793

Agenda

- Application Solicitation
- What to Submit
- What NOT to Submit
- Application Review and Selection
- Notification
- Where to get help

Application Solicitation

- Current solicitation is for FY2009 highway program (July 1, 2008 to June 30, 2009)
- IDOT Circular Letter 2007-18 located at IDOT website-Public Partners-Bureau of Local Roads Circular Letters-Informational Circular Letters
- http://www.dot.state.il.us/blr/manuals/infocirculars/CL2007-18.pdf
- Multi-year applications are acceptable
- Goal is to accomplish local safety improvement projects that reduce fatal and serious injury crashes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Address http://www.dot.state.il.us/safety.html
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TRAVELING PUBLIC MAPS PROJECTS ROAD CLOSURES NEWS DOING BUSINESS LETTING & BIDDING CAREERS @ IDOT GENERAL INFO
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Environment
Inspector General
IPASS
Motorcycling
OBWD
Public Partners
Public Transportation
Safety Information
Secretary of State
Highway Safety Plans & Programs
Illinois Comprehensive Highway Safety Plan
FY2007 Highway Safety Plan (DTS)
DTS Highway Safety Program
Annual Evaluation – 2006
Highway Safety Plans and Program History
HSIP - Highway Safety Improvement Plan (DOH)
Safe Routes to School
Illinois Traffic Records Coordinating
Committee (ITRCC)
Highway Safety Performance Plan - FY08 New
Illinois Crash Data
Illinois Fatal Crash Summary
Illinois Crash Facts & Statistics
SR1050 Instruction Manual
Motorist Crash Reporting
Information
SR 8 E Form & SR 8 E Instructions
Fatality Analysis Reporting
Work Zone Safety
National Work Zone Awareness Week
Keep Us Alive. Stay Alive. Drive 45
Campaign
Photo Speed Enforcement
Work Zone Safety Calendar
Work Zone Safety and Mobility Rule: Safety 3-07
Work Zone Safety
Keep Us Alive.
Stay Alive. Drive 45.
Seat Belt Usage in Illinois
Illinois Safety Belt Use Law
Saved by the Safety Belt Club
Safety Belt Usage Reports
Click It or Ticket Campaign Reports
CLICK IT OR TICKET
Child Passenger Safety
Visit the "Buckle Up Illinois" Web
- Have your Car Seat Checked
http://www.dot.state.il.us/safety.html
Local intranet
Start Inbox - Microsoft ... 20071126 Draft A... HSIP LocalRds Conf_C... Jim-HSIP-HRRRP ... Illinois Departm...
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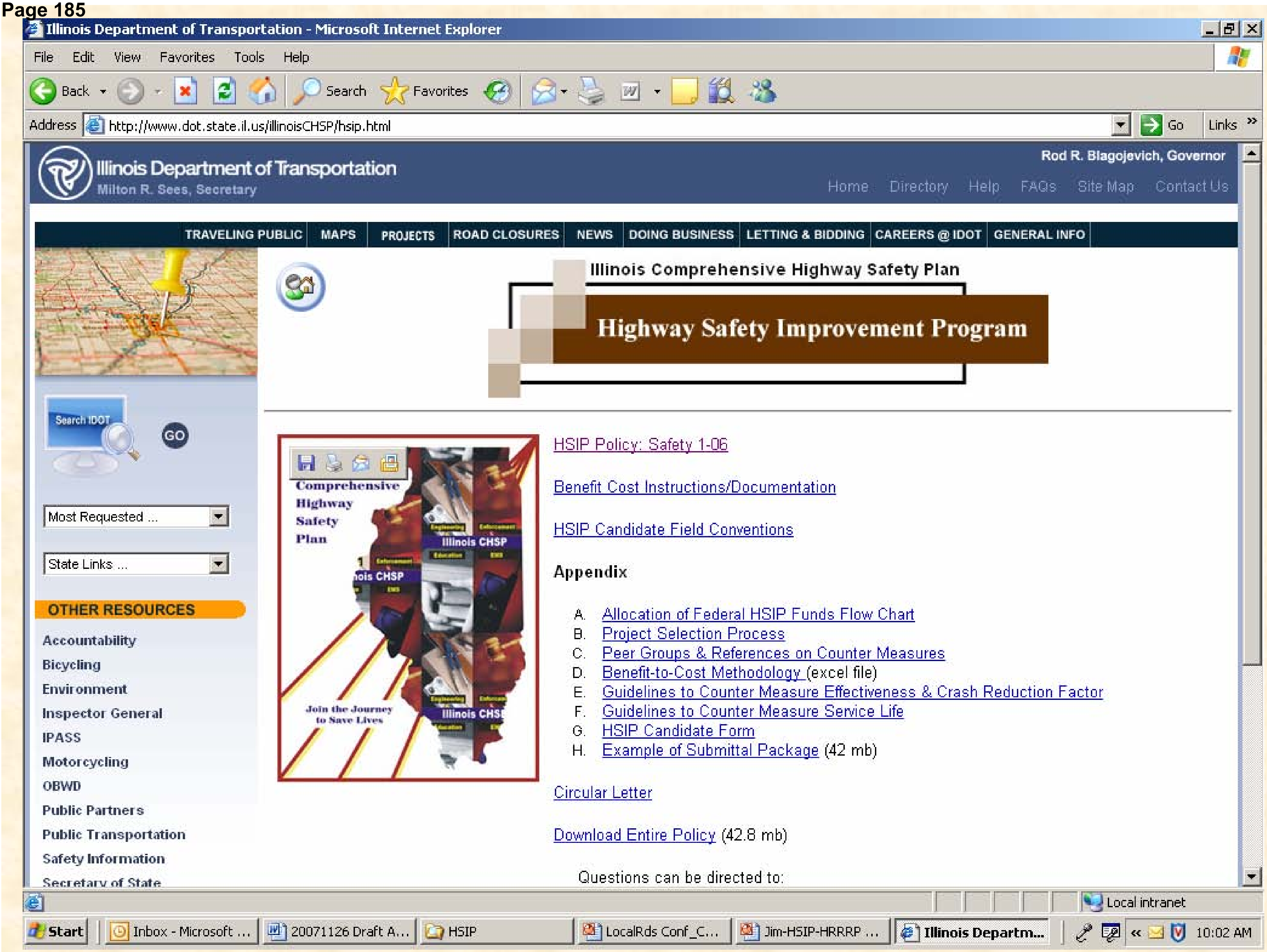
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Inspector General
IPASS
Motorcycling
OBWD
Public Partners
Public Transportation
Safety Information
Secretary of State
Comprehensive Highway Safety Plan
Illinois CHSP
Join the Journey to Save Lives
HSIP Policy: Safety 1-06
Benefit Cost Instructions/Documentation
HSIP Candidate Field Conventions
Appendix
A. Allocation of Federal HSIP Funds Flow Chart
B. Project Selection Process
C. Peer Groups & References on Counter Measures
D. Benefit-to-Cost Methodology (excel file)
E. Guidelines to Counter Measure Effectiveness & Crash Reduction Factor
F. Guidelines to Counter Measure Service Life
G. HSIP Candidate Form
H. Example of Submittal Package (42 mb)
Circular Letter
Download Entire Policy (42.8 mb)
Questions can be directed to:
Local intranet
Start Inbox - Microsoft ... 20071126 Draft A... HSIP LocalRds Conf_C... Jim-HSIP-HRRRP ... Illinois Departm... 10:02 AM

HSIP Application: What to Submit

- Cover letter: Why should this project be funded with federal safety funds intended to reduce fatal and serious injury crashes?
- HSIP Form
  - Project information and location
  - Location characteristics
  - CHSP emphasis area / project category
  - Crash details
  - Problem description / identification
  - Countermeasures proposed
  - Cost analysis / crash summary details

HSIP Application: What to Submit CHSP Emphasis Areas

1. Alcohol and other impaired driving
2. Driver behavior and awareness
3. Highway-railroad grade crossings
4. Information systems for decision making
5. Intersections
6. Large trucks
7. Roadway departures
8. Vulnerable users
9. Work zones
10. Safety belts / occupant protection

HSIP Application: What to Submit

- Location map
- Benefit Cost Analysis
  - Summary sheet
  - Explanation in cover letter or separate paragraph of adaptations or assumptions
- Crash reports: All fatal (K crash) and serious injury (A or B injury crash)
- Crash analysis information to justify proposed countermeasure
- Collision Diagrams
- Photos (site conditions and aerial photos)
- Existing plan sheets
- Road Safety Assessment findings
- Relevant newspaper articles/local public support
- Funding plan and cost estimate with year and availability/source of local match

Ralph Sedgwick 11/2001

ILLINOIS TRAFFIC CRASH REPORT

Sheet __ of __ Sheets

5102776

1371301-1 6

DRAC	PEDV	TRFD	TRFC	WEAT	DRVA	VIS	VEHD	LIGHT	COLL	MANV	PPA	PPL
U1 7 U2 X	X	1	1	1	U1 4 U2 X	U1 1 U2 X	U1 1 U2 X	4	6	U1 15 U2 X	X	X

INVESTIGATED BY: Fulton Co Sheriff POLICE

TYPE OF REPORT: ■ ON-SCENE ☐ NOT ON-SCENE ☐ SUPPLEMENTARY

☐ A No Injury / Drive Away ■ B Injury and / or Tow Due To Crash

AGENCY CRASH REPORT NO. 01 7022

ADDRESS NO. (OPTIONAL)

HIGHWAY or STREET NAME: NB Co Hwy 24

CITY/TOWNSHIP (CIRCLE): Farmington

COUNTY: Fulton 29

.2 FT / MI (CIRCLE) N E S W (CIRCLE) Cottonwood Rd

☐ AT INTERSECTION WITH (NAME OF INTERSECTION OR ROAD FEATURE)

INTERSECTION RELATED ☐ Yes ■ No

PRIVATE PROPERTY ■ Yes ■ No

HIT & RUN ☐ Yes ■ No

DATE OF CRASH 09/27/01 (mo day yr)

TIME 1:30 ■ AM ☐ PM

ANY SINGLE VEHICLE/PROPERTY DAMAGED OVER $500 ■ Yes ☐ No

NO. MOTOR VEHICLES INVLD

LARS CODE

LARS CODE

TRFW 1 | VEHT U1 15 U2 X | NO LANES 2 | ALGN 6 | RSUR 1 | VEHU U1 2 U2 X | RDEF 1 | BAC U1 96 U2 X | NO. OCCS U1 1 U2 X | DRP U1 1 U2 X

UNIT 1

NAME (LAST, FIRST, M.I.) ■ DRIVER ☐ PED ☐ PEDAL ☐ EQUES ☐ ANIM ☐ VEH

[redacted]

DATE OF BIRTH 02/06/79 (mo day yr)

SEX M | SAFT 2 | AIR 9

INJURY K | EJECT 2

STATE Il | CLASS D

MAKE Jeep | MODEL Grd Cherokee | YEAR 2000

STATE Il | YEAR

[redacted]

CIRCLE NUMBER(S) FOR DAMAGED AREA(S): 00 - NONE, 10 - UNDER CARRIAGE, 11 - TOTAL (ALL AREAS), 12 - OTHER, 99 - UNKNOWN

POINT OF CONTACT 11

FRONT / REAR

TOWED DUE TO DAMAGE Y ■ N ☐ | OTHER ☐ ☐ | FIRE ☐ ■ | HAZ MAT ☐* ■ | COM VEH ☐* ■

INSURANCE CO.

TAKEN TO Proctor | EMS AGENCY Fulton

UNIT 2

[redacted]

DATE OF BIRTH (mo day yr) | SEX | SAFT | AIR | INJURY | EJECT | STATE | CLASS

MAKE | MODEL | YEAR | STATE | YEAR

CIRCLE NUMBER(S) FOR DAMAGED AREA(S): 00 - NONE, 10 - UNDER CARRIAGE, 11 - TOTAL (ALL AREAS), 12 - OTHER, 99 - UNKNOWN

POINT OF CONTACT

TOWED DUE TO DAMAGE Y ☐ N ☐ | OTHER ☐ ☐ | FIRE ☐ ☐ | HAZ MAT ☐* ☐ | COM VEH ☐* ☐

INSURANCE CO.

TAKEN TO | EMS AGENCY

OWNER ADDRESS (street, city, state, zip) | TELEPHONE | POLICY NO.

UNIT	SEAT	DOB	SEX	SAFT	AIR	INJ	EJCT
		/ /					
		/ /					
		/ /					
		/ /					
		/ /					

[redacted]

(HOSP) (EMS)

	EVNO	MOST	EVNT	LOC
UNIT 1	1	☐	1	3
	2	☐	37	3
	3	■	2	3
UNIT 2	1	☐		
	2	☐		
	3	☐		

[redacted]

DAMAGED PROPERTY

[redacted]

...ton Il 61531

SECTION | CITATION NO.

[redacted]

P1099

DATE POLICE NOTIFIED 09 27 01 | TIME NOTIFIED 6:30 ■ AM ☐ PM

COURT DATE / / | COURT TIME ☐ AM ☐ PM

OFFICER ID. 42 | SIGNATURE | BEAT / DIST. N | SUPERVISOR ID #18

*IF YES, COMPLETE COMMERCIAL VEHICLE AREA ON BACK OF FORM

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SR 1050 200M (REPRINT 10/00)

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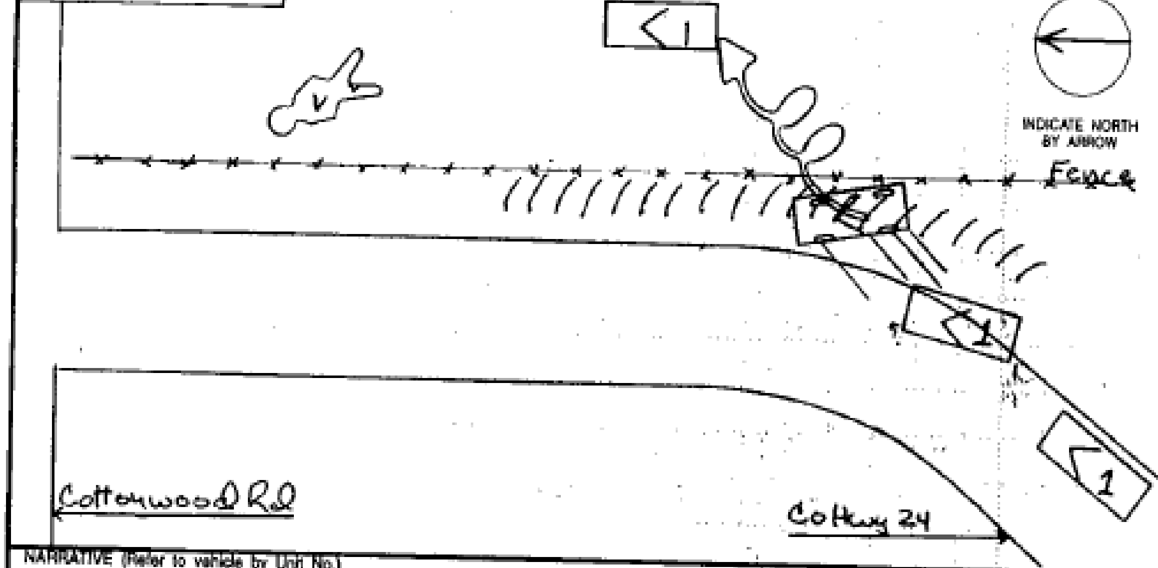
DIAGRAM



NARRATIVE (Refer to vehicle by Unit No.)

Unit#1 was NB on Co Hwy 24 .2 mi S. of Cottonwood Rd at this point Unit#1 left the roadway to the East. Unit#1 was skidding broadside and struck the embankment. Upon impact Unit#1 became airborne continuing E. into a soybean field. Unit#1 rolled over approx 3 times. Unit#1 Driver was ejected from Unit#1 and was Found approx 100' from Unit#1 to the North

COMMERCIAL VEHICLE UNIT NO.

CARRIER NAME
ADDRESS
CITY STATE ZIP
SOURCE: ☐ Side of truck ☐ Papers ☐ Driver ☐ Log book
ID NUMBER GVWR
US DOT or State No. ICCMC State Name ☐ None
HAZARDOUS MATERIALS: PLACARDED? ☐ Yes ☐ No
If Yes: 4-Digits 1-Digit or Name
Hazardous cargo released from truck? (do not count fuel from vehicle fuel tank) Y ☐ N ☐ Unk
Violation of HAZMAT regs. contribute to crash? ☐ ☐ ☐
Violation of MCS regs. contribute to crash? ☐ ☐ ☐
Inspection form completed? Y N Unk
- HAZMAT ☐ ☐ ☐ Out of Service? Y ☐ N ☐ Form No.
- MCS ☐ ☐ ☐ Out of Service? ☐ ☐
IDOT PERMIT # WIDE LOAD ☐ ☐
TRAILER WIDTH(S) 0-96" 97-102" Over 102" TRAILER LENGTH(S) - ft VEHICLE LENGTH (TOTAL) - ft
Trailer 1 ☐ ☐ ☐ Trailer 1
Trailer 2 ☐ ☐ ☐ Trailer 2 NO. OF AXLES
☐ IN CITY OF / ☐ NEAREST CITY: Miles N E S W of: (Circle)
INSERT APPLICABLE NUMBERS FROM CHOICES ON BACK OF TEMPLATE TWO
VEHICLE CONFIGURATION CARGO BODY TYPE LOAD TYPE

COMMERCIAL VEHICLE UNIT NO.

CARRIER NAME
ADDRESS
CITY STATE ZIP
SOURCE: ☐ Side of truck ☐ Papers ☐ Driver ☐ Log book
ID NUMBER GVWR
US DOT or State No. ICCMC State Name ☐ None
HAZARDOUS MATERIALS: PLACARDED? ☐ Yes ☐ No
If Yes: 4-Digits 1-Digit or Name
Hazardous cargo released from truck? (do not count fuel from vehicle fuel tank) Y ☐ N ☐ Unk
Violation of HAZMAT regs. contribute to crash? ☐ ☐ ☐
Violation of MCS regs. contribute to crash? ☐ ☐ ☐
Inspection form completed? Y N Unk
- HAZMAT ☐ ☐ ☐ Out of Service? Y ☐ N ☐ Form No.
- MCS ☐ ☐ ☐ Out of Service? ☐ ☐
IDOT PERMIT # WIDE LOAD ☐ ☐
TRAILER WIDTH(S) 0-96" 97-102" Over 102" TRAILER LENGTH(S) - ft VEHICLE LENGTH (TOTAL) - ft
Trailer 1 ☐ ☐ ☐ Trailer 1
Trailer 2 ☐ ☐ ☐ Trailer 2 NO. OF AXLES
☐ IN CITY OF / ☐ NEAREST CITY: Miles N E S W of: (Circle)
INSERT APPLICABLE NUMBERS FROM CHOICES ON BACK OF TEMPLATE TWO

HSIP Application: What to Submit "Where do I get crash reports?"

- Look in "Investigated by:" box in upper left corner to determine who handled crash
- Local law enforcement investigated, contact that agency
- Illinois State Police, contact Patrol Records Unit, ph: 217.785.0614
  - Need as much info as available: date of crash, driver or passenger name, report #, IDOT # is located beneath bar code on top right
  - $5 for crash reports, $20 for crash reconstruction reports
  - www.isp.state.il.us/traffic.crashreports.cfm
- IDOT Division of Traffic Safety can provide summary reports; POC is Mary Ann Paulis, ph: 217.782.2575; prevented by statute from providing crash report

Location map/aerial photo example:

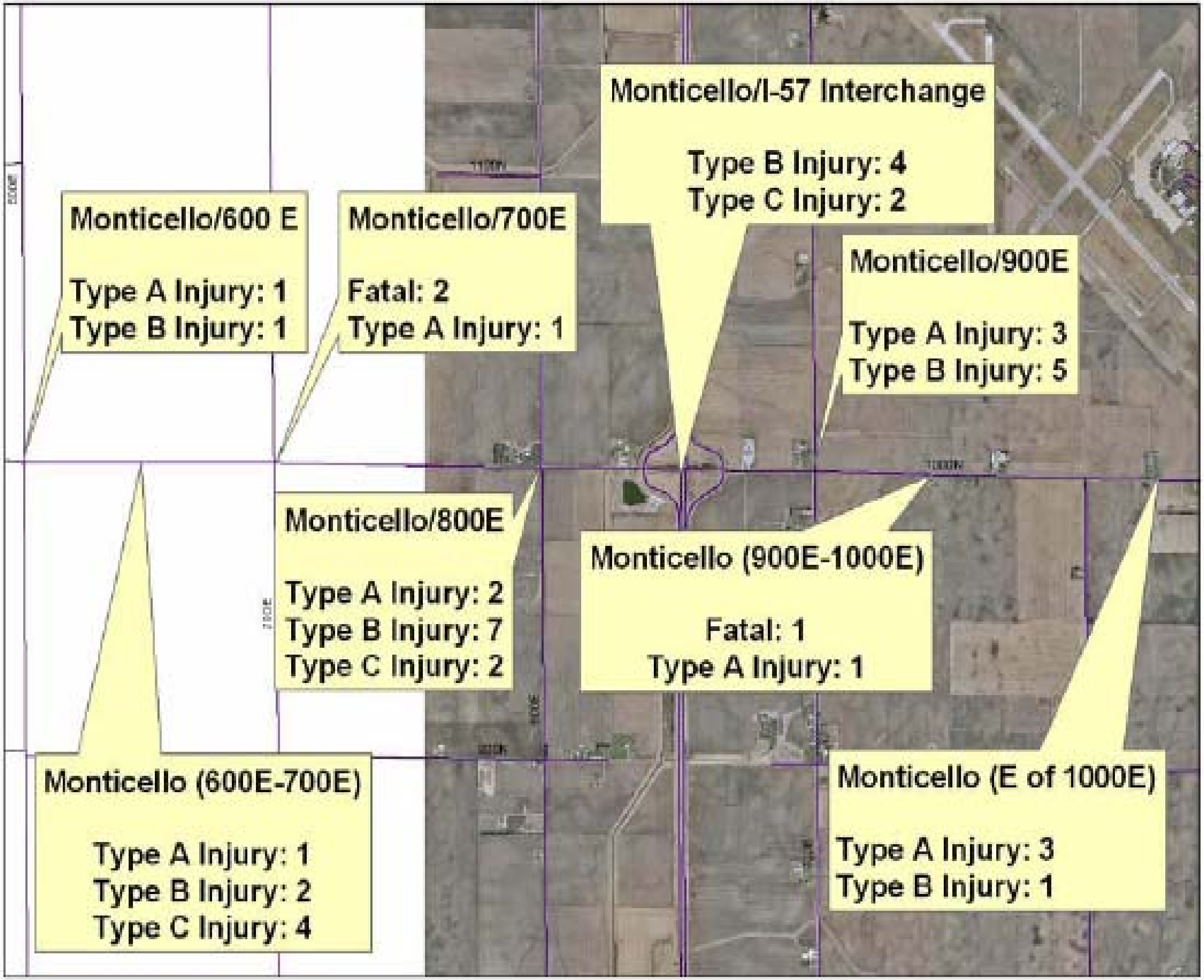


FIGURE 4 INJURY SEVERITY SUMMARY

Collision Distribution example:

Analysis of Crash Data 1995-2006
Athens Blacktop Road
County Highway 2 (FAS Route 574)
All 299 Crashes Plotted

Legend

- + Fatal Accidents
- × A-Injuries
- • Non-Deer Impacts
- • Deer Impact

FIGURE 1

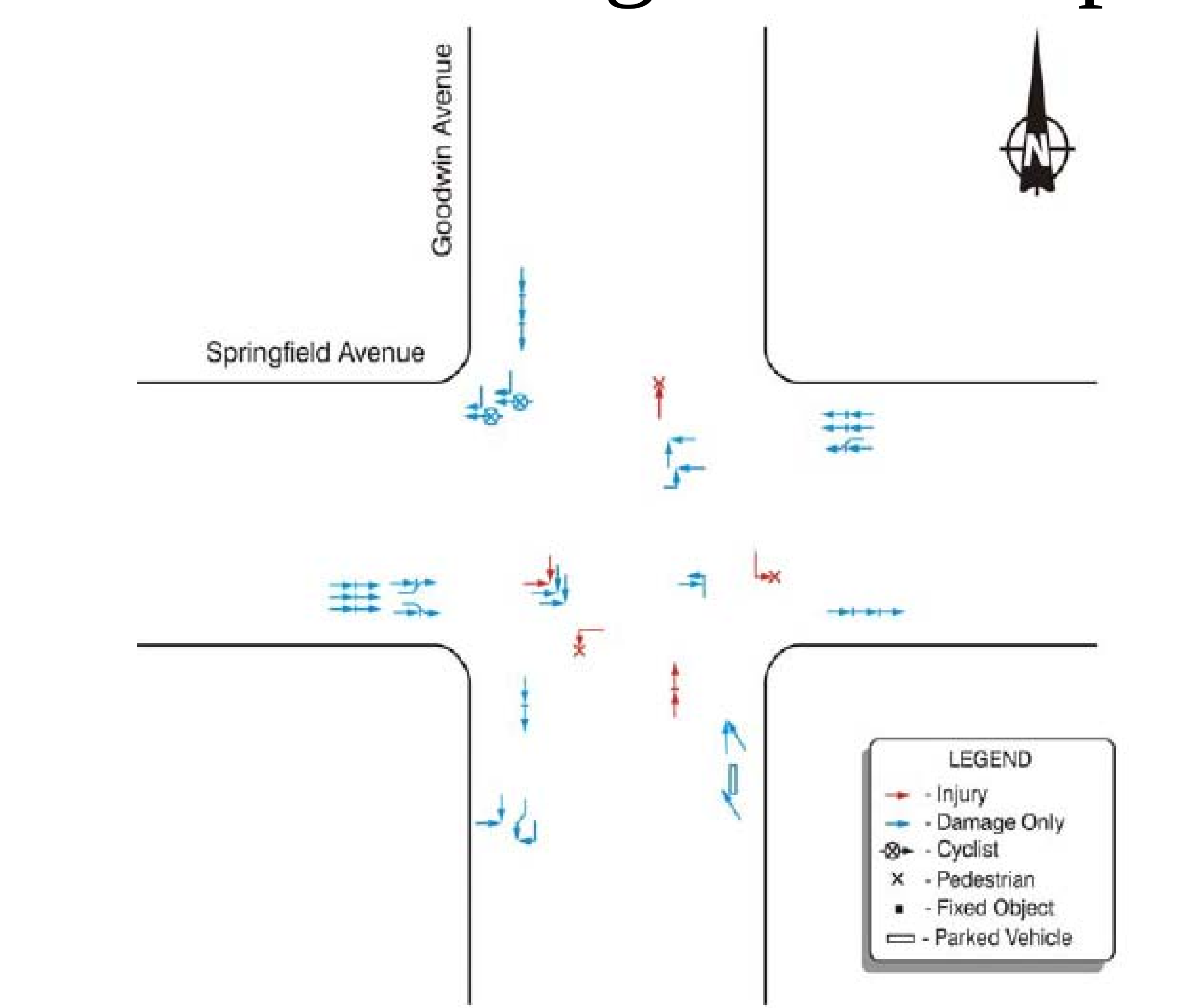
Page 4 of 15

Collision Distribution example:

TABLE 1 COLLISION TYPE DISTRIBUTION

COLLISION TYPE	YEAR						TOTAL
	2002	2003	2004	2005	2006	2007	
Angle	1	4	5	5	4		19
Animal				1	1		2
Fixed object					2		2
Head on			1				1
Left turn		2			1		3
Rear-end			2	3	1		6
Run-off the road		3	4	4	5	1	17
Sideswipe opposite direction		1		1			2
Sideswipe same direction		1		2			3
Turning					1		1
Grand Total	1	11	12	16	15	1	56

Collision Diagram example:



Goodwin Avenue and Springfield Avenue Spatial Collision Distribution

Collision Type Chart example:

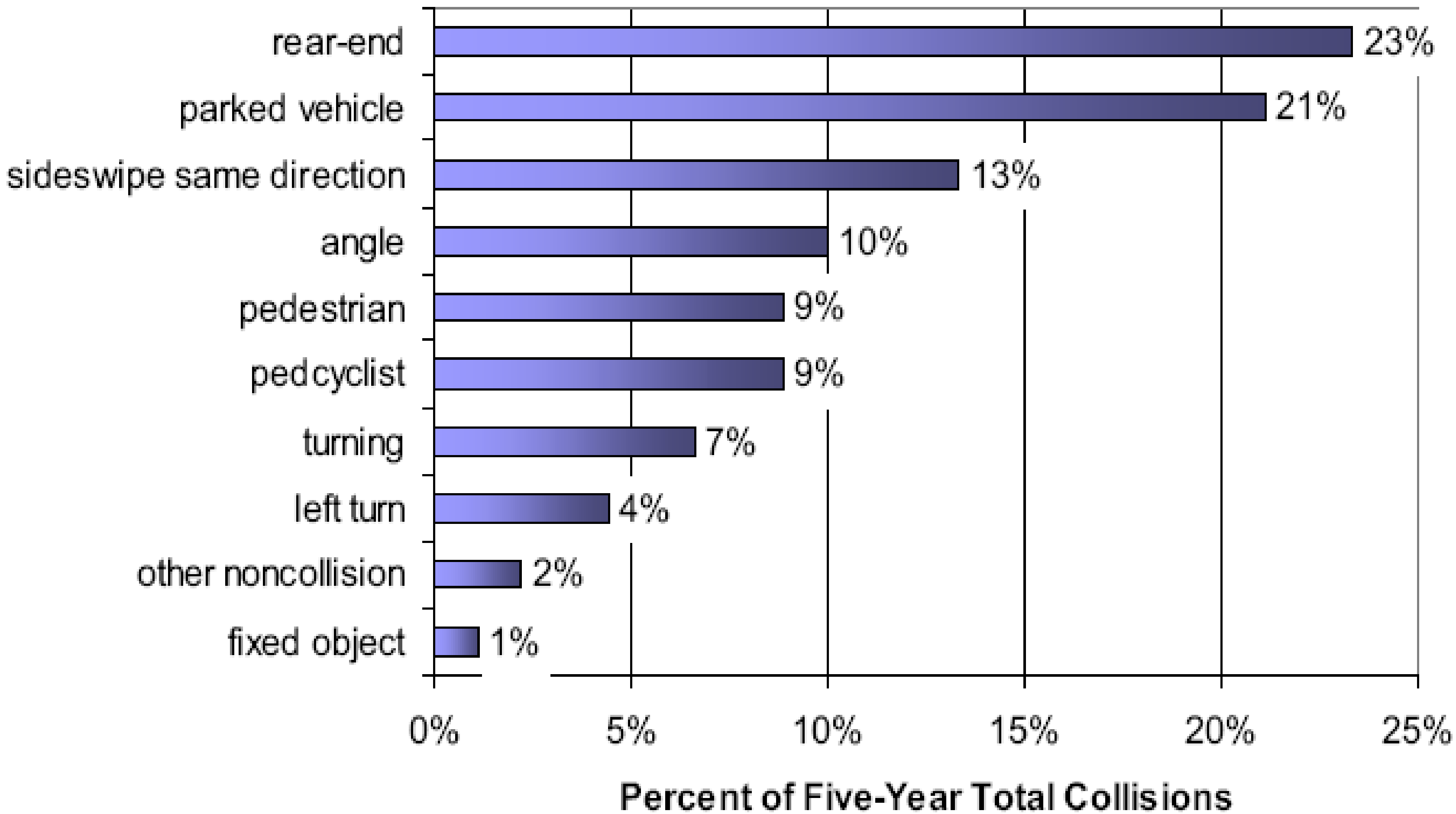
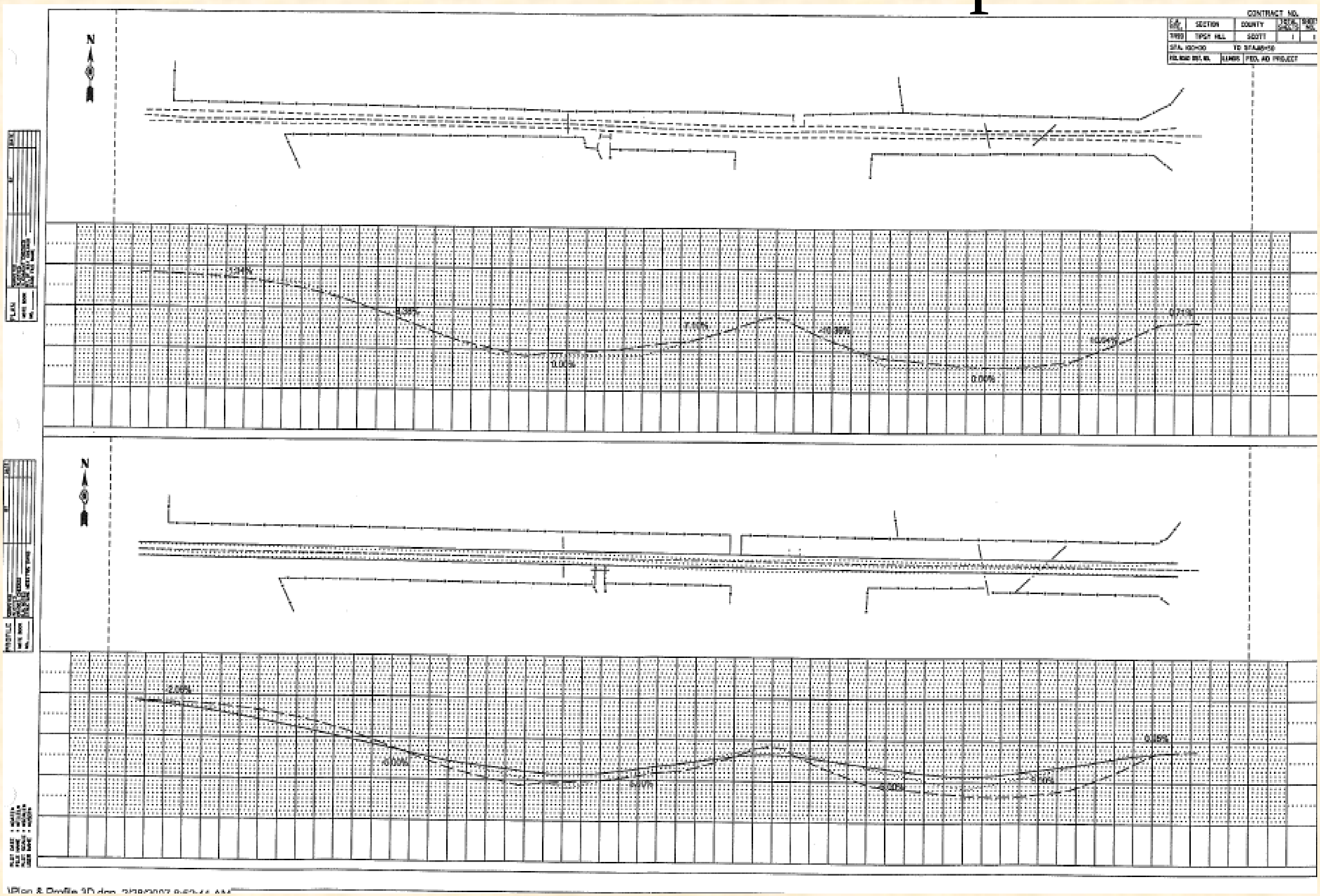


FIGURE 2 COLLISION TYPES

Plan and Profile example:



Example photos:

Damage Caused During Fatal Accident

Southbound Reed Station Rd.

RSA Finding example:

•The horizontal and vertical alignment on South Market Road directly south of Cochran Road is an emphasis area of concern for horizontal and vertical alignment, considering the area's crash history and night visibility.

Expected Frequency	**Occasional**
Expected Severity	**High**
Risk Rating	**Significant**
E	

Suggested Countermeasures

• Advanced warning, pavement markings, grading, chevrons, object markers, fixed object removal. ***LCSI***

• Extend or grate culvert and widen shoulders through curve

• Realign South Market from south of Cochran to Fox. This work should be the subject of a detailed engineering study to determine the various considerations and optimal treatment to improve safety

Funding Plan example:

Estimate of Cost (2008)
Morton Grove
Waukegan Road Lighting Improvements
Standard Roadway Lighting

Pay Item	Unit	Quantity	Unit Cost	Extended Cost
Traffic Control	L SUM	1	$ 10,000.00	$ 10,000.00
Sidewalk	SQ FT	800	$ 10.00	$ 8,000.00
Sodding	SQ YD	345	$ 12.00	$ 4,140.00
Electric Service Installation	EACH	1	$ 2,000.00	$ 2,000.00
Electric Utility Service Connection	L SUM	1	$ 2,000.00	$ 2,000.00
Unit Duct	FOOT	5000	$ 7.50	$ 37,500.00
Conduit, Pushed	FOOT	1500	$ 25.00	$ 37,500.00
Light Pole Foundation	FOOT	288	$ 185.00	$ 53,280.00
Lighting Controller	EACH	1	$ 9,000.00	$ 9,000.00
Service Conductors	FOOT	600	$ 8.50	$ 5,100.00
Breakaway Devices	EACH	32	$ 400.00	$ 12,800.00
Roadway Light Pole	EACH	32	$ 3,500.00	$ 112,000.00
Roadway Luminaire	EACH	32	$ 700.00	$ 22,400.00
			Sub-total:	$ 297,720.00
			Contigency (15%):	$ 44,658.00
			Design Engineering:	$ 29,779.71
			Total:	$ 372,157.71

Page 2/Monroe County Highway Dept./Federal Highway High Risk Rural Road Safety Program Funding Request/March 07

Project Funding Proposal Construction

STR	$ 760,000
HBP	$ 200,000
SAFETY	$ 300,000 Requested
LOCAL	$ 490,000
TOTAL	$1,750,000

HSIP Application: What to Submit

- Implementation of 4E approach (include previous and current efforts to supplement engineering solution to the identified problem)
- Submit NLT March 1, 2008 to District Bureau of Local Roads and Streets
- Hard copy or electronic submission; cover letter with CD containing all supporting documentation as ‘pdf’

HSIP Application: What NOT to Submit

- Every crash report from the location
- Over-abundance of letters of support
- Unrealistic project scope or limits
- Low-ball cost estimates to increase B/C ratio
- Improvement costs for items not related to implementing the justified countermeasure
- Projects for roads under state jurisdiction; work with IDOT District office based on statewide priorities

Application Review and Selection

- Central Safety Committee:
  - 2 FHWA
  - 3 Safety Engineering
  - 1 Design & Environment
  - 1 Central BLRS
- Purpose:
  - Ensure equal consideration of all projects
  - Provide consistent standards and uniformity in the selection process

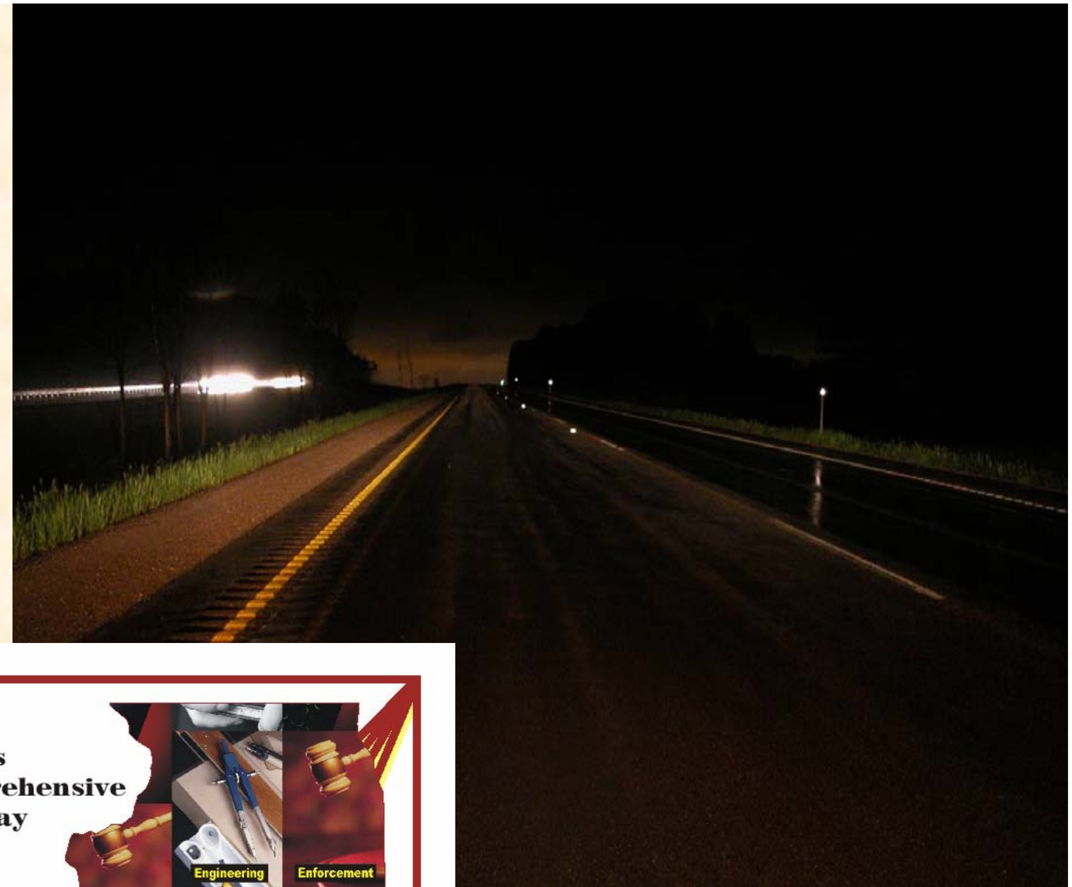
Notification of Selection

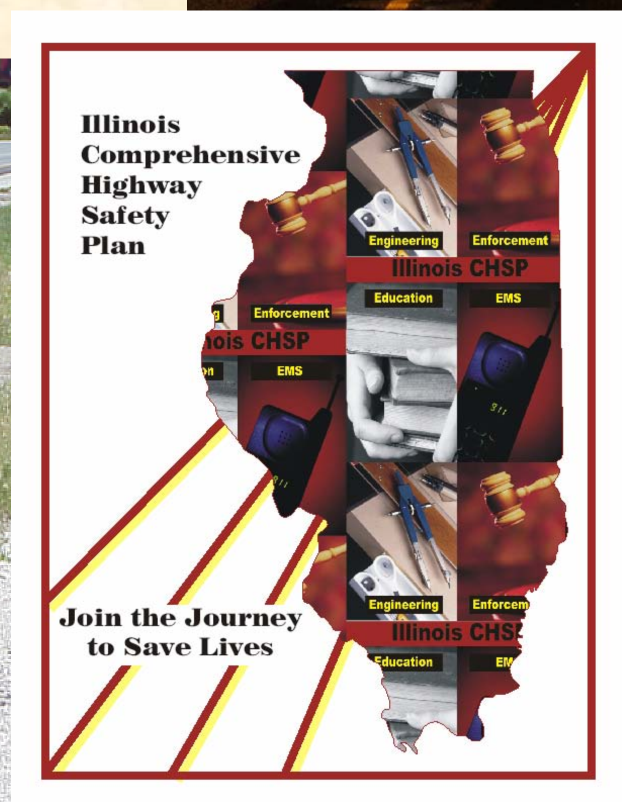
- Safety Committee recommendation approved by Director of Highways
- Local agency notified through District Bureau of Local Roads and Streets
- Local agency initiates joint funding agreement process
- Federal funds approved is “90% NOT TO EXCEED” approved amount
- Federal procedures must be followed

Getting Help

- IDOT web site: http://www.dot.state.il.us/illinoisCHSP/hsip.html
- Contact any of the presenters from this workshop
- Contact your District Bureau of Local Roads and Streets

Questions???



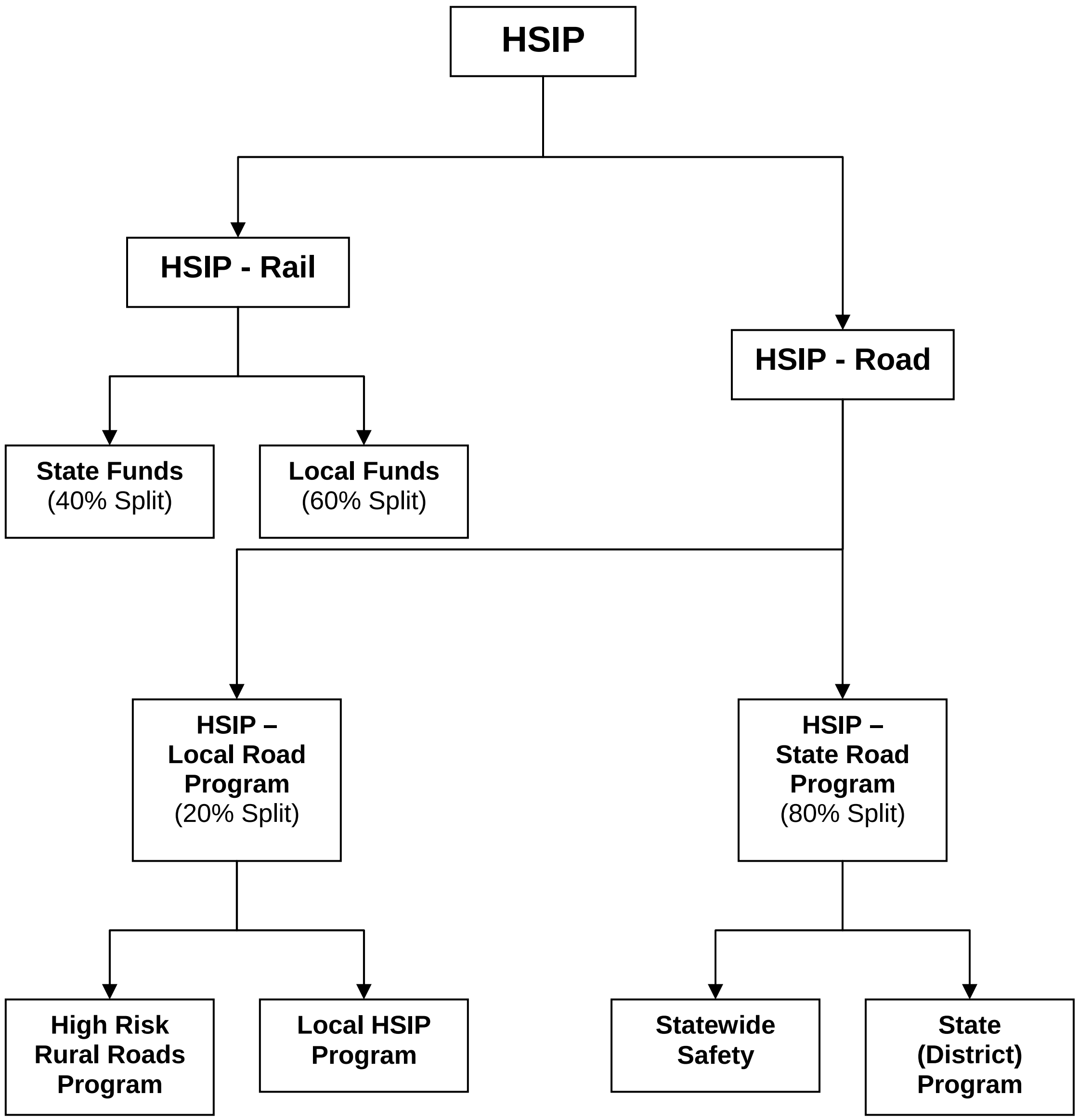

Illinois
Comprehensive
Highway
Safety
Plan
Engineering
Enforcement
Illinois CHSP
Education
EMS
Join the Journey
to Save Lives

APPENDIX A

Funding Allocation Process
Federal HSIP Funding Flow Chart

APPENDIX A

Funding Allocation Process
Highway Safety Improvement Program (HSIP)

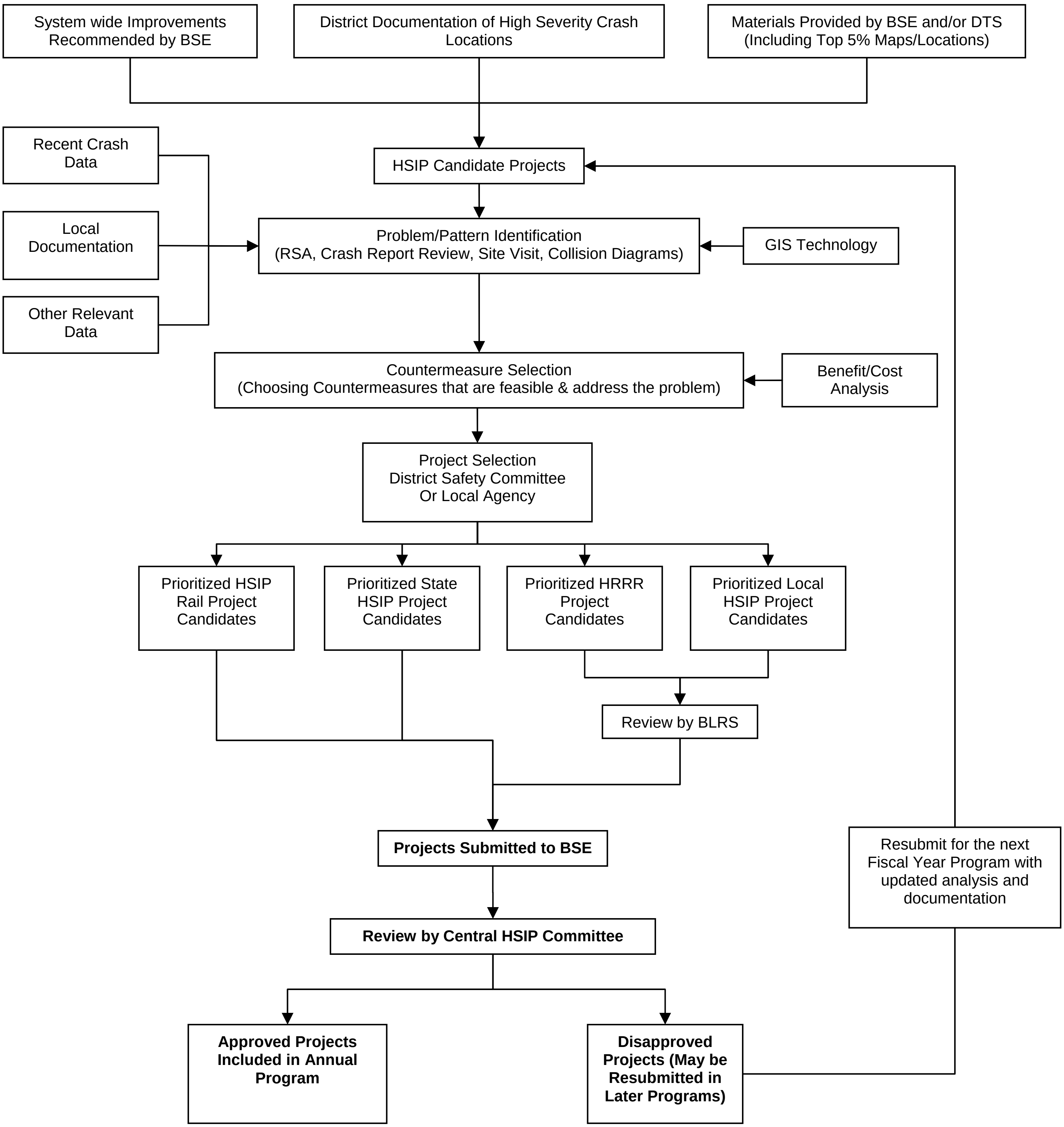


APPENDIX B

HSIP Project Selection Process

APPENDIX B

HSIP Project Selection Process Flow Chart



APPENDIX C

Peer Groups and References on Countermeasures

PEER GROUPS

		Type of Street	Type of Location	Group 1	Group 2	Group 3
1	Rural	2 Way Street	1 Segment	2 and less	3 and more	
2			2 Non-Signalized Int.	3 and less	4 and more	
3			3 Signalized Int.	All lanes		
4			4 Bridge	All lanes		
5			5 RR Crossing	All lanes		
6			6 Ramps			
7		1 Way Street	7 Segment	All lanes		
8			8 Non-Signalized Int.	All lanes		
9			9 Signalized Int.	All lanes		
10			10 Bridge	All lanes		
11			11 RR Crossing	Same as rural 2 way		
12			12 Ramps			
13		Divided Highway No Access Control	13 Segment	All lanes	3 and more	
14			14 Non-Signalized Int.	All lanes	4 and more	
15			15 Signalized Int.	All lanes		
16			16 Bridge	All lanes		
17			17 RR Crossing	Same as rural 2 way		
18			18 Ramps			
19		Bidirectional Lanes	19 Segment	All lanes		
20			20 Non-Signalized Int.	All lanes		
21			21 Signalized Int.	All lanes		
22			22 Bridge	All lanes		
23			23 RR Crossing	Same as rural 2 way		
24			24 Ramps			
25		Freeway	25 Segment	All lanes		
26			26 Non-Signalized Int.	All lanes		
27			27 Signalized Int.	All lanes		
28			28 Bridge	All lanes		
29			29 RR Crossing	None		
30			30 Ramps			
31	Urban	2 Way Street	31 Segment	2 and less	3 and more	
32			32 Non-Signalized Int.	3 and less	4 and more	
33			33 Signalized Int.	3 and less	4 and more	
34			34 Bridge	All lanes		
35			35 RR Crossing	All lanes		
36			36 Ramps			
37		1 Way Street	37 Segment	2 and less	3 and more	
38			38 Non-Signalized Int.	2 and less	3 and more	
39			39 Signalized Int.	2 and less	3 and more	
40			40 Bridge	All lanes		
41			41 RR Crossing	All lanes		
42			42 Ramps			
43		Divided Highway No Access Control	43 Segment	2 and less	3, 4 lanes	5 and more
44			44 Non-Signalized Int.	3 and less	4 lanes	5 and more
45			45 Signalized Int.	3 and less	4 lanes	5 and more
46			46 Bridge	All lanes		
47			47 RR Crossing	All lanes		
48			48 Ramps			
49		Bidirectional Lanes	49 Segment	3 and less	4 and more	
50			50 Non-Signalized Int.	3 and less	4 and more	
51			51 Signalized Int.	3 and less	4 and more	
52			52 Bridge	All lanes		
53			53 RR Crossing	All lanes		
54			54 Ramps			
55		Freeway	55 Segment	4 and less	5 and more	
56			56 Non-Signalized Int.	4 and less	5 and more	
57			57 Signalized Int.	None		
58			58 Bridge	4 and less	5 and more	
59			59 RR Crossing	None		
60			60 Ramps			

Published References on Safety Countermeasures

1. **NCHRP 500 Series**
   a. Volume 01: A Guide for Addressing Aggressive-Driving Collisions
   b. Volume 02: A Guide for Addressing Collisions Involving Unlicensed Drivers and Drivers with Suspended or Revoked Licenses
   c. Volume 03: A Guide for Addressing Collisions with Trees in Hazardous Locations
   d. Volume 04: A Guide for Addressing Head-On Collisions
   e. Volume 05: A Guide for Addressing Unsignalized Intersection Collisions
   f. Volume 06: A Guide for Addressing Run-Off-Road Collisions
   g. Volume 07: A Guide for Reducing Collisions on Horizontal Curves
   h. Volume 08: A Guide for Reducing Collisions Involving Utility Poles
   i. Volume 09: A Guide for Reducing Collisions Involving Older Drivers
   j. Volume 10: A Guide for Reducing Collisions Involving Pedestrians
   k. Volume 11: A Guide for Increasing Seat Belt Use
   l. Volume 12: A Guide for Reducing Collisions at Signalized Intersections
   m. Volume 13: A Guide for Reducing Collisions Involving Heavy Trucks

2. **NCHRP 430 - Improved Safety Information to Support Highway Design**

3. **NCHRP 440 – Accident Mitigation Guide for Congested Rural Two-Lane Highways**

4. **NCHRP Research Digest 299**

APPENDIX D

Benefit-to-Cost Methodology

PROJECT DESCRIPTION - PROJECT DATA INPUT (INTERSECTIONS)

Project:		*Prepared by:*	
Location:		*Current AADT:* Major Street	
		Minor Street	
Crash data:	1 Years, From ___ to ___	*Traffic Growth factor:*	1.0%
		Interest rate:	1.0%
Control type	SIGNALIZED INTERSECTIONS		

PROCESS STEPS - Benefit Cost Calculations (INTERSECTIONS)

User will input data only in Highlighted Cells

STEP - 1	Enter Project Description Data.
STEP - 2	Select Control Type (Signalized or Unsignalized Intersections)
STEP - 3	Input crash data for the analysis period based on crash severity by crash type (Note: If the countermeasure selected does not affect all legs of the intersection then enter only crash data for the affected legs)
STEP - 4	Enter the list of potential countermeasures selected from the drop down menus***
STEP - 5	Enter "Unit Cost" for the countermeasure selected
STEP - 6	Update the "Quantity" for each countermeasure selected for cost calculations (Example: If adding a Left Turn Lane is the selected countermeasure and applied to 2-Legs of the Intersection, then the "Quantity = 2")
STEP - 7	Calculate cost of countermensures selected by clicking on the "Cost Calculation" button
STEP - 8	The B/C will be reported in Cell E45 based on the analysis

INTERSECTION CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD

	ALL	AG	AN	FO	HO	LT	NGT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	ROR	RT	SSD	SOD	T	TR	WP
Fatal Crashes	1																				
A-Injury Crashes	5																				
B-Injury Crashes	12																				
C-Injury Crashes	15																				
PDO Crashes	30																				

INTERSECTION BENEFIT COST ANALYSIS

BENEFIT CALCULATIONS | COUNTERMEASURE COST CALCULATIONS

COUNTERMEASURE	CRF	Crash Type affected by this improvement	Unit Cost	Quantity	Units	Total Cost	Service Life	Present Worth	EUAC
Improvement/Realignment/Reconstruction URBAN	50%	All	650000	1	Unit Qnty	$650,000	15	$650,000	$46,880
	0%	0			0	$0	0	$0	$0
	0%	0			0	$0	0	$0	$0
	0%	0			0	$0	0	$0	$0
	0%	0			0	$0	0	$0	$0
TOTAL BENEFIT	*$3,438,677*		*TOTAL COST*						*$46,880*

Cost Calculation

BENEFIT/ COST	73

****NOTE: IF THE NUMBER OF LEGS AFFECTED VARIES BY COUNTERMEASURES SELECTED, THEN CALCULATE THE BENEFIT-COST RATIO FOR EACH COUNTERMEASURE SEPERATELY (Use separate spreadsheets for each countermeasure applied).*

Legend

ALL	All Crashes
AG	Angle
AN	Animal
FO	Fixed Object
HO	Head On
LT	Left Turn
NGT	Night Time crash
OtherNC	Other Noncollision
OtherO	Other Object
OVT	Overturned
PD	Pedestrian
PDC	Pedalcyclist
PKV	Parked Vehicle
RE	Rear End
ROR	Run-off-the-Road
RT	Right Turn
SSD	Sideswipe Same Direction
SOD	Sideswipe Opposite Direction
T	Turning
TR	Train
WP	Wet Pavement

CRF	Crash Reduction Factor
EUAC	Estimated Uniforma Annual Cost

INFORMATION ONLY

PROJECT DESCRIPTION - PROJECT DATA INPUT (SEGMENTS)

Project:		*Prepared by:*		
Location:		*Current AADT:*	2000	
		Length:	2	Miles
Crash data:	6 Years	*Traffic Growth factor*	0.5%	
	From 2000 to 2005	*Interest rate*	5.0%	

Highway class:
RURAL HIGHWAYS

PROCESS STEPS - Benefit Cost Calculations (SEGMENTS)

User will input data only in Highlighted Cells

STEP - 1 Enter Project Description Data.
STEP - 2 Select Highway Class (Urban or Rural Highways)
STEP - 3 Input crash data for the analysis period based on crash severity by crash type
STEP - 4 Enter the list of potential countermeasures selected from the drop down menus
STEP - 5 Enter **"Unit Cost"** for the countermeasure selected
STEP - 6 Update the **"Quantity"** for each countermeasure selected for cost calculations
(Example: If Shoulder Rumble Strips are selected for a 3-mile segment in both directions, then the "Quantity = (3x2) = 6")
STEP - 7 Calculate cost of countermensures selected by clicking on the "Cost Calculation" button
STEP - 8 The B/C will be reported in Cell E45 based on the analysis

SEGMENTS CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD

	All Crashes	Angle	Animal	Fixed Object	Head On	Left Turn	Night Time crash	Other Noncollision	Other Object	Overturned	Pedestrian	Pedalcyclist	Parked Vehicle	Rear End	Run-off-the-Road	Right Turn	Sideswipe Same Direction	Sideswipe Opposite Direction	Turning	Train	Wet Pavement
	ALL	*AG*	*AN*	*FO*	*HO*	*LT*	*NGT*	*OtherNC*	*OtherO*	*OVT*	*PD*	*PDC*	*PKV*	*RE*	*ROR*	*RT*	*SSD*	*SOD*	*T*	*TR*	*WP*
Fatal Crashes	2																				
A-Injury Crashes	2			4																	
B-Injury Crashes	2	3																			
C-Injury Crashes																					
PDO Crashes																					

SEGMENTS BENEFIT COST ANALYSIS

BENEFIT CALCULATIONS — CRF: Crash Reduction Factor

COUNTERMEASURE COST CALCULATIONS — EUAC: Estimated Uniforma Annual Cost

COUNTERMEASURE	CRF	Crash Type affected by this improvement	Unit Cost	Quantity	Units	Total Cost	Service Life	Present worth	EUAC
General/Fixed Obstacle Removal	50%	FO,ROR	1000	7.4	Unit Qnty	$7,400	20	$7,400	$713
	0%	0	10	5	0	$50	0	$0	$0
	0%	0	10	2	0	$20	0	$0	$0
	0%	0			0	$0	0	$0	$0
	0%	0			0	$0	0	$0	$0
TOTAL BENEFIT	*$90,449*		*TOTAL COST*						*$713*

Cost Calculation

BENEFIT/ COST	127

MODULE01 - ANNUALIZED COST (CRASH S

INTERSECTION ANALYSIS

Project:		*Prepared by:*	0
Location:		*Current AADT:* Major Street	0
		Minor Street	0
Crash data:	1 years	Traffic Growth factor	1%
	From 0 to 0	Interest rate	1%

CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD (Data Referenced from"*Benefit_Cost_Intersection"* Worksheet)

	ALL	AG	AN	FO	HO	LT	NGT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	ROR	RT	SSD	SOD	T	TR	WP
Fatalities	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A-Injury	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B-Injury	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C-Injury	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PDO	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

CRASH SEVERITY DISTRIBUTION BY CRASH TYPE (ADJUSTMENT TO CRASH TYPE AFFECTED BASED ON COUNTERMEASURE SELECTED)

	ALL	AG	AN	FO	HO	LT	NGT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	ROR	RT	SSD	SOD	T	TR	WP
Fatalities	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A-Injury	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B-Injury	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C-Injury	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PDO	30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ANNUALIZED CRASH SEVERITY BY CRASH TYPE

	ALL	AG	AN	FO	HO	LT	NGT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	ROR	RT	SSD	SOD	T	TR	WP
Fatalities	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A-Injury	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B-Injury	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C-Injury	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PDO	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SIGNALIZED INTERSECTIONS - ANNUALIZED COST (CRASH SEVERITY BY CRASH TYPE)

	ALL	AG	AN	FO	HO	LT	NGT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	ROR	RT	SSD	SOD	T	TR	WP
Fatalities	4132054	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A-Injury	1380765	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B-Injury	839363	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C-Injury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PDO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6352182	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

UNSIGNALIZED INTERSECTIONS - ANNUALIZED COST (CRASH SEVERITY BY CRASH TYPE)

	ALL	AG	AN	FO	HO	LT	NGT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	ROR	RT	SSD	SOD	T	TR	WP
Fatalities	4389257	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A-Injury	1364234	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B-Injury	821280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C-Injury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PDO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6574771	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

SEVERITY BY CRASH TYPE) - REFERENCE ONLY

SEGMENT ANALYSIS

Project:		*Prepared by:*	0	
Location:		*Current AADT:*	2000	
		Length:	2	miles
Crash data:	6 years	*Traffic Growth factor*	1%	
	From 2000 to 2005	*Interest rate*	5%	

CRASH SEVERITY DISTRIBUTION BY CRASH TYPE FOR ANALYSIS PERIOD (Data Referenced from*"Benefit_Cost_Segments"* Worksheet)

	ALL	*AG*	*AN*	*FO*	*HO*	*LT*	*NGT*	*OtherNC*	*OtherO*	*OVT*	*PD*	*PDC*	*PKV*	*RE*	*ROR*	*RT*	*SSD*	*SOD*	*T*	*TR*	*WP*
Fatalities	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A-Injury	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B-Injury	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C-Injury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PDO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

CRASH SEVERITY DISTRIBUTION BY CRASH TYPE (ADJUSTMENT TO CRASH TYPE AFFECTED BASED ON COUNTERMEASURE SELECTED)

	ALL	*AG*	*AN*	*FO*	*HO*	*LT*	*NGT*	*OtherNC*	*OtherO*	*OVT*	*PD*	*PDC*	*PKV*	*RE*	*ROR*	*RT*	*SSD*	*SOD*	*T*	*TR*	*WP*
Fatalities	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A-Injury	2	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B-Injury	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C-Injury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PDO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ANNUALIZED CRASH SEVERITY BY CRASH TYPE

	ALL	*AG*	*AN*	*FO*	*HO*	*LT*	*NGT*	*OtherNC*	*OtherO*	*OVT*	*PD*	*PDC*	*PKV*	*RE*	*ROR*	*RT*	*SSD*	*SOD*	*T*	*TR*	*WP*
Fatalities	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
A-Injury	0.3	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B-Injury	0.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
C-Injury	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PDO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

URBAN HIGHWAYS - ANNUALIZED COST (CRASH SEVERITY BY CRASH TYPE)

	ALL	*AG*	*AN*	*FO*	*HO*	*LT*	*NGT*	*OtherNC*	*OtherO*	*OVT*	*PD*	*PDC*	*PKV*	*RE*	*ROR*	*RT*	*SSD*	*SOD*	*T*	*TR*	*WP*
Fatalities	1413146	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A-Injury	83878	0	0	167755	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B-Injury	21246	31869	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C-Injury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PDO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1518270	31869	0	167755	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

RURAL HIGHWAYS - ANNUALIZED COST (CRASH SEVERITY BY CRASH TYPE)

	ALL	*AG*	*AN*	*FO*	*HO*	*LT*	*NGT*	*OtherNC*	*OtherO*	*OVT*	*PD*	*PDC*	*PKV*	*RE*	*ROR*	*RT*	*SSD*	*SOD*	*T*	*TR*	*WP*
Fatalities	1458233	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
A-Injury	86193	0	0	172386	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B-Injury	21014	31521	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C-Injury	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PDO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1565439	31521	0	172386	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

COUNTERMEASURES LIST: CRASH REDUCTION FACTORS, COST, SERVICE LIFE AND CRASH TYPE AFFEC

	COUNTERMEASURES	Cost	Unit	Service Life	CRF	Crash Type Affected by Countermeasures	All	AG	AN	FO	HO	LT
1												
2	**Intersection Locations**											
3	***General***											
4	*Improvement/Realignment/Reconstruction URBAN*		Unit Qnty	15	50%	All	50%					
5	*Improvement/Realignment/Reconstruction RURAL*		Unit Qnty	15	30%	All	30%					
6	***Pavement***											
7	*Widening and Resurfacing or Widening alone*		Miles	15	25%	All	25%					
8	*Resurfacing alone*		Miles	10	-							
9	*De-Slick (formerly known as skidproofing)*		Miles	5	45%	WP						
10	*Rumble Strips (Shoulder)*		Miles	3	30%	FO,ROR,OVT-off the road				30%		
11	*Rumble Strips (Centerline)*		Miles	3	-							
12	*Rumble Strips (Transverse)*		Miles	3	25%	All	25%					
13	*Channelization*		Miles	15	50%	RE,HO,SSD,SOD,LT,ROR					50%	50%
14	*Raised Reflective Marker Median*		Miles	15	50%	HO,SOD,LT					50%	50%
15	*Rumble Strip Median*		Miles	10	50%	HO,SOD,LT					50%	50%
16	*Thermoplastic or Preformed Tape Median*		Miles	3	50%	RE,HO,SSD,SOD,LT,RT					50%	50%
17	*Painted Median*		Miles	2	50%	RE,HO,SSD,SOD,LT,RT					50%	50%
18	*Lane Addition*		Unit Qnty	15	50%	RE,SSD, LT,RT						50%
19	*Left Turn Lane*		Unit Qnty	15	25%	Each leg w/added Left turn, RE,SSD,SOD,LT						25%
20	*Right Turn Lane*		Unit Qnty	15	25%	Each leg w/added Right turn, RE,SSD,LT						25%
21	*Bidirectional Left Turn Lane*		Unit Qnty	15	50%	RE,HO,SSD,SOD,LT					50%	50%
22	*Left Turn Acceleration Lane*		Unit Qnty	15	50%	RE,SOD,SSD,AG,LT		50%				50%
23	*Right Turn Acceleration Lane*		Unit Qnty	15	50%	RE,SSD,RT						
24	*Deceleration Lane*		Unit Qnty	15	50%	RE,SSD,RT						
25	*One-Way Couple*		Unit Qnty	15	50%	All	50%					
26	*Install Roundabout*		Unit Qnty	15	60%	All	60%					
27	*Install Passing Lane*		Unit Qnty	15	25%	All						
28	*Increase Width of Paved Shoulder*		Miles	10	10%	All						
29	*Increase Lane Width*		Miles	15	10%	All						
30	***Signing***											
31	*Modernization*		Unit Qnty	6	25%	All	25%					
32	*Installation*		Unit Qnty	6	40%	All	40%					
33	*Speed Signing*		Unit Qnty	6	40%	All	40%					
34	*Advance Warning Signs*		Unit Qnty	6	25%	All	25%					
35	*Street Name Signs*		Unit Qnty	6	25%	All	25%					
36	*Four Way Stop*		Unit Qnty	5	50%	All	50%					
37	*Minor Leg Stop*		Unit Qnty	5	40%	AG,LT,RT		40%				40%
38	*Yield Sign*		Unit Qnty	5	40%	AG,LT,RT		40%				40%
39	*Changeable Message Signs*		Unit Qnty	6	10%	All	10%					
40	*Delineators*		Unit Qnty	4	40%	All	40%					
41	*Overhead Sign Truss*		Unit Qnty	15	40%	RE,SOD						
42	***Signalization***											

Modernization		Unit Qnty	10	25%	PD,FO,RE,SSD,SOD,AG,LT,RT		25%		25%		25%
Install Traffic Signals		Unit Qnty	15	23%,-38%	23% All Other. -38% RE. 67% RAG		67%	23%	23%	23%	23%
Relocation of Signal Supports		Unit Qnty	15	25%	FO				25%		
Advance Warning with Flasher		Unit Qnty	10	15%	OVT,FO,RE,SSD,SOD,AG,LT,RT,ROR		15%		15%		15%
Red/Yellow Flashing Beacon		Unit Qnty	10	NR	Not recommended.						
Red Flashing Beacon		Unit Qnty	10	45%	AG		45%				
Add Left Turn Phase with Left Turn Lane		Unit Qnty	10	35%	All	35%					
Add Left Turn Phase without Left Turn Lane		Unit Qnty	10	25%	All	25%					
Phase Adjustment		Unit Qnty	10	25%	All	25%					
Increase to 12 Inch Lens		Unit Qnty	10	25%	All	25%					
Add Traffic Actuation		Unit Qnty	10	25%	RE,AG,LT,RT		25%				25%
Time Lane Control		Unit Qnty	10	25%	HO,SOD					25%	
Optical Programmed		Unit Qnty	10	25%	RE,AG,LT,RT		25%				25%
Add Pedestrian Controls		Unit Qnty	10	25%	PD,PDC						
Add Mast Arms and Signal Head per Lane		Unit Qnty	15	25%	RE,AG,LT,RT		25%				25%
Safety Lighting		Unit Qnty	15	25%	25% All Other. 50% NGT		25%	25%	25%	25%	25%
Install Automated Enforcement of Red Light Violations		Unit Qnty	10	25%	AG, -15% RE		25%				
User defined 01											
User defined 02											
User defined 03											
Non-Intersection (Segment) Locations											
Pavement Treatments											
Widening and Resurfacing or Widening alone		Miles	15	25%	All	25%					
Resurfacing alone		Miles	10	0%	No CRF identified						
De-Slick (formerly known as skidproofing)		Miles	5	45%	WP						
Rumble Strips (Shoulder)		Miles	3	30%	FO,ROR				30%		
Rumble Strips (Centerline)		Miles	3	20%	HO, SOD					20%	
Pavement Marking											
General Pavement Marking		Miles	1	30%	All	30%					
Raised Reflective Markers		Miles	4	30%	NGT on tangent sections. For curves, see table1						
Railroad Crossing											
Modification		Miles	15	50%	TR,FO,RE,ROR				50%		
Gates		Miles	15	60%	TR,FO,RE,ROR				60%		
Crossbucks		Miles	15	60%	TR,FO				60%		
Flashing lights		Unit Qnty	15	60%	TR,FO,RE,ROR				60%		
Flashing Beacons		Unit Qnty	15	60%	TR,FO,RE,ROR				60%		
Warning Bells		Unit Qnty	15	50%	TR						
Pavement Markings		Miles	2	30%	TR,RE,ROR						
Warning Signs - Standard		Unit Qnty	2	40%	TR,FO,RE,ROR				40%		
Warning Signs - Special		Unit Qnty	5	40%	TR,FO,RE,ROR				40%		
Delineators		Miles	4	40%	TR,FO,ROR				40%		
Safety Lighting		Unit Qnty	15	50%	TR,FO,RE,ROR				50%		
Resurfacing		Miles	10	25%	TR,FO,RE,ROR				25%		
Grade Separation		Unit Qnty	20	100%	All	100%					

26	*Removal (especified which type of removal)*		Miles	20	50%	All	50%					
27	***Bridge***											
28	*General Repair*		Miles	10	15%	PKV, HO,SOD,SSD,ROR					15%	
29	*Widen/Resurface*		Miles	15	15%	FO,HO,SOD,SSD,ROR				15%	15%	
30	*Widening*		Miles	15	15%	FO,HO,SOD,SSD,ROR				15%	15%	
31	*De-Slick*		Miles	5	45%	WP						
32	*Grooving*		Miles	7	45%	WP						
33	*Frost/Ice Detectors - Sign*		Unit Qnty	10	25%	FO,HO,SOD,SSD,ROR				25%	25%	
34	*Frost/Ice Detectors - Radio*		Unit Qnty	10	25%	PKV, HO,SOD,SSD,ROR					25%	
35	*Guardrail*		Miles	10	15%	FO,ROR				15%		
36	*Separation between Pedestrians/Traffic*		Miles	15	95%	PD,PDC,FO				95%		
37	*Safety Lighting*		Unit Qnty	15	50%	NGT						
38	*Delineators*		Miles	4	15%	FO,ROR				15%		
39	*Impact Attenuators*		Unit Qnty	3	70%	FO,ROR				70%		
40	*Reconstruction*		Miles	20	50%	FO,HO,SOD,SSD,ROR				50%	50%	
41	***Curves***											
42	*Realignment/Reconstruction URBAN*		Miles	15	35%	OVT,FO,HO,SSD,SOD,ROR				35%	35%	
43	*Superelevation*		Miles	15		Variable, see table2						
44	*Daylighting*		Miles	15	30%	OVT,FO,HO,SSD,SOD,ROR				30%	30%	
45	*Widening and Resurfacing or Widening alone*		Miles	15	25%	All	25%					
46	*De-Slick (formerly known as skidproofing)*		Miles	5	45%	WP						
47	*Guardrail*		Miles	10	40%	FO,ROR				40%		
48	*Advance Warning Sign*		Unit Qnty	5	20%	All	20%					
49	*Chevrons or Delineators*		Unit Qnty	4	40%	OVT,HO,SOD,ROR					40%	
50	*Relocation*		Unit Qnty	15	45%	All	45%					
51	***Roadside Safety***											
52	*General/Fixed Obstacle Removal*		Unit Qnty	20	50%	FO,ROR				50%		
53	*Curb Parking Removal*		Unit Qnty	20	50%	PKV,RE,ROR						
54	*Guardrail*		Miles	10	15%	FO,ROR				15%		
55	*Utility Adjustment*		Miles	15	45%	FO,ROR involving utility hazards				45%		
56	*Drainage Improvement*		Miles	10	10%	All	10%					
57	*Shoulder Improvement*		Miles	5	10%	FO,ROR				10%		
58	*Impact Attenuators*		Miles	3	70%	FO,ROR				70%		
59	*Glare Shields*		Miles	10	15%	SSD,AG,ROR		15%				
60	*Fencing*		Miles	10	15%	All	15%					
61	***Other***											
62	*Turnouts (Mailbox or other)*		Miles	15	50%	Entering or exiting vehicles from shoulder area						
63	*Ramp Improvement*		Miles	15		Variable. See table						
64	*User defined 01*											
65	*User defined 02*											
66	*User defined 03*											
67												

INFORMATION ONLY

TED BY COUNTERMEASURE - (REFERENCE ONLY)

NGT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE	ROR	RT	SSD	SOD	T	TR	WP
														45%
								30%						
							50%	50%		50%	50%			
											50%			
											50%			
							50%		50%	50%	50%			
							50%		50%	50%	50%			
							50%		50%	50%				
							25%			25%	25%			
							25%			25%				
							50%			50%	50%			
							50%			50%	50%			
							50%		50%	50%				
							50%		50%	50%				
									40%					
									40%					
							40%				40%			

Legend	
ALL	All Crashes
AG	Angle
AN	Animal
FO	Fixed Object
HO	Head On
LT	Left Turn
NGT	Night Time crash
OtherNC	Other Noncollision
OtherO	Other Object
OVT	Overturned
PD	Pedestrian
PDC	Pedalcyclist
PKV	Parked Vehicle
RE	Rear End
ROR	Run-off-the-Road
RT	Right Turn
SSD	Sideswipe Same Direction
SOD	Sideswipe Opposite Direction
T	Turning
TR	Train
WP	Wet Pavement

				25%			25%		25%	25%	25%			
23%	23%	23%	23%	23%	23%	23%	-38%	23%	23%	23%	23%	23%	23%	23%
			15%				15%	15%	15%	15%	15%			
							25%		25%					
											25%			
							25%		25%					
				25%	25%									
							25%		25%					
50%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
							-15%							
													45%
								30%						
											20%			
							50%	50%					50%	
							60%	60%					60%	
													60%	
							60%	60%					60%	
							60%	60%					60%	
													50%	
							30%	30%					30%	
							40%	40%					40%	
							40%	40%					40%	
								40%					40%	
							50%	50%					50%	
							25%	25%					25%	

						15%		15%		15%	15%			
								15%		15%	15%			
								15%		15%	15%			
														45%
														45%
								25%		25%	25%			
						25%		25%		25%	25%			
								15%						
				95%	95%									
50%														
								15%						
								70%						
								50%		50%	50%			
			35%					35%		35%	35%			
			30%					30%		30%	30%			
														45%
								40%						
			40%					40%			40%			
								50%						
						50%	50%	50%						
								15%						
								45%						
								10%						
								70%						
								15%		15%				

STATE-WIDE AVERAGE (1999-2003) ACCIDENT COSTS BY FATALITY AND INJURIES (REFERENCE ONLY)

SIGNALIZED INTERSECTIONS

	Fatalities	A-Injury	B-Injury	C-Injury	PDO
Fatals	1.07	0.48	0.64	0.23	1.10
A-crashes	0.00	1.37	0.37	0.22	1.20
B-crashes	0.00	0.00	1.45	0.23	1.44
C-crashes	0.00	0.00	0.00	1.39	1.64
PDO	0.00	0.00	0.00	0.00	0.00

Cost/Fatality,Injuries
$3,760,000
$188,000
$48,200
$0
$0

	Fatalities	A-Injury	B-Injury	C-Injury	PDO	Total cost
Fatals	$4,011,599	$89,457	$30,999	$0	$0	$4,132,054
A-crashes	$0	$258,225	$17,928	$0	$0	$276,153
B-crashes	$0	$0	$69,947	$0	$0	$69,947
C-crashes	$0	$0	$0	$0	$0	$0
PDO	$0	$0	$0	$0	$0	$0

UNSIGNALIZED INTERSECTIONS

	Fatalities	A-Injury	B-Injury	C-Injury	PDO
Fatals	1.13	0.65	0.59	0.15	0.76
A-crashes	0.00	1.36	0.36	0.17	1.11
B-crashes	0.00	0.00	1.42	0.19	1.38
C-crashes	0.00	0.00	0.00	1.37	1.62
PDO	0.00	0.00	0.00	0.00	0.00

Cost/Fatality,Injuries
$3,760,000
$188,000
$48,200
$0
$0

	Fatalities	A-Injury	B-Injury	C-Injury	PDO	Total cost
Fatals	$4,238,226	$122,628	$28,403	$0	$0	$4,389,257
A-crashes	$0	$255,285	$17,562	$0	$0	$272,847
B-crashes	$0	$0	$68,440	$0	$0	$68,440
C-crashes	$0	$0	$0	$0	$0	$0
PDO	$0	$0	$0	$0	$0	$0

URBAN HIGHWAYS

	Fatalities	A-Injury	B-Injury	C-Injury	PDO
Fatals	1.10	0.39	0.31	0.10	0.73
A-crashes	0.00	1.28	0.23	0.13	1.11
B-crashes	0.00	0.00	1.32	0.14	1.33
C-crashes	0.00	0.00	0.00	1.33	1.60
PDO	0.00	0.00	0.00	0.00	0.00

Cost/Fatality,Injuries
$3,760,000
$188,000
$48,200
$0
$0

	Fatalities	A-Injury	B-Injury	C-Injury	PDO	Total cost
Fatals	$4,151,917	$72,431	$15,089	$0	$0	$4,239,438
A-crashes	$0	$240,652	$10,981	$0	$0	$251,633
B-crashes	$0	$0	$63,738	$0	$0	$63,738
C-crashes	$0	$0	$0	$0	$0	$0
PDO	$0	$0	$0	$0	$0	$0

RURAL HIGHWAYS

	Fatalities	A-Injury	B-Injury	C-Injury	PDO
Fatals	1.13	0.51	0.35	0.06	0.33
A-crashes	0.00	1.31	0.26	0.06	0.51
B-crashes	0.00	0.00	1.31	0.07	0.66
C-crashes	0.00	0.00	0.00	1.24	1.03
PDO	0.00	0.00	0.00	0.00	0.00

Cost/Fatality,Injuries
$3,760,000
$188,000
$48,200
$0
$0

	Fatalities	A-Injury	B-Injury	C-Injury	PDO	Total cost
Fatals	$4,261,333	$96,625	$16,740	$0	$0	$4,374,698
A-crashes	$0	$246,058	$12,521	$0	$0	$258,578
B-crashes	$0	$0	$63,041	$0	$0	$63,041
C-crashes	$0	$0	$0	$0	$0	$0
PDO	$0	$0	$0	$0	$0	$0

INFORMATION ONLY

INTERSECTION COUNTERMEASURE COST CALCULATIONS (REFERENCE ONLY)

Project: ____________________ *Prepared by:* 0

Location: ____________________ *Current AADT:* Major Street 0

Minor Street 0

Crash data: 1 years — Traffic Growth factor 1.0%

From 0 to 0 — Interest rate 1.0%

INTERSECTION COUNTERMEASURE COST CALCULATIONS DETAILS

	Cost	Service Life	Rate of return	
Improvement/Realignment/Reconstruction URBAN	$650,000	15	1%	15
0	$0	0		
0	$0	0		
0	$0	0		
0	$0	0		

Calculate cost

Longest Service Life 15

		1st time	2nd time	3rd time	4th time	5th time	6th time	7th time	8th time	9th time	10th time	11th time	12th time	13th time
			1	2	3	4	5	6	7					
Countermeasure 1	$650,000	$650,000												
Countermeasure 2	$0													
Countermeasure 3	$0													
Countermeasure 4	$0													
Countermeasure 5	$0													

	EUAC
Countermeasure 1	$46,880
Countermeasure 2	$0
Countermeasure 3	$0
Countermeasure 4	$0
Countermeasure 5	$0
ANNUAL TOTAL COUNTERMEASURE COST	**$46,880**

INFORMATION ONLY

14th time	15th time	16th time	17th time	18th time	19th time	20th time

SEGMENTS COUNTERMEASURE COST CALCULATIONS (REFERENCE ONLY)

Project:		*Prepared by:*	0
Location:		*Current AADT:*	2000
		Length:	2 miles
Crash data:	6 years (From 2000 to 2005)	*Traffic Growth factor*	0.5%
		Interest rate	5.0%

SEGMENTS COUNTERMEASURE COST CALCULATIONS DETAILS

		Cost	Service Life	Interest rate	
General/Fixed Obstacle Removal		$7,400	20	5%	20
	0	$50	0		
	0	$20	0		
	0	$0	0		
	0	$0	0		

Calculate Cost

Longest Service Life 20

			1	2	3	4	5	6	7				
		1st time	2nd time	3rd time	4th time	5th time	6th time	7th time	8th time	9th time	10th time	11th time	12th time
Countermeasure 1	$7,400	$7,400											
Countermeasure 2	$0												
Countermeasure 3	$0												
Countermeasure 4	$0												
Countermeasure 5	$0												

	EUAC
Countermeasure 1	$713
Countermeasure 2	$0
Countermeasure 3	$0
Countermeasure 4	$0
Countermeasure 5	$0
ANNUAL TOTAL COUNTERMEASURE COST	$713

13th time	14th time	15th time	16th time	17th time	18th time	19th time	20th time

INTERSECTIONS COUNTERMEASURE BENEFIT CALCULATIONS - (REFERENCE ONLY)

Project:			*Prepared by:*		0
Location:			*Current AADT:*	Major Street	0
				Minor Street	0
Crash data:	1	years		Traffic Growth factor	1%
	From 0	to 0		Interest rate	1%
				Longest Service Life	15

INTERSECTION BENEFIT CALCULATIONS INCLUDING COMBINED CRF BY CRASH TYPE

		ALL	AG	AN	FO	HO	LT	NGT	OtherNC	OtherO	OVT	PD	PDC
Improvement/Realignment/Reconstruction URBAN	4	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		Direct											
Combined CRF		0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Parcial Benefit		$3,176,091	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

Benefits from Countermeasures **$3,176,091**

$$G = \frac{P}{\frac{(1+i)^n - 1}{i^2(1+i)^n} - \frac{n}{i(1+i)^n}}$$

Benefits from Countermeasures	$3,176,091	
Uniform Gradient Present Worth (G)	$38,534	Increment due to traffic growth, starting on year 2
Uniform Gradient Present Series (A)	$262,586	Annualized gradient at certain interest rate over the longest service life

$$A = G\left[\frac{1}{i} - \frac{n}{(1+i)^n - 1}\right]$$

ANNUAL TOTAL COUNTERMEASURE BENEFIT	$3,438,677

INFORMATION ONLY

PKV	*RE*	*ROR*	*RT*	*SSD*	*SSO*	*T*	*TR*	*WP*
0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%	0%	0%	0%

0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
$0	$0	$0	$0	$0	$0	$0	$0	$0

SEGMENTS COUNTERMEASURE BENEFIT CALCULATIONS - (REFERENCE ONLY)

Project:		*Prepared by:*	0
Location:		*Current AADT:*	2000
		Length:	2 miles
Crash data:	6 years	*Traffic Growth factor*	1%
	From 2000 to 2005	*Interest rate*	5%
		Longest Service Life	20 years

SEGMENTS BENEFIT CALCULATIONS INCLUDING COMBINED CRF BY CRASH TYPE

Countermeasure		ALL	AG	AN	FO	HO	LT	NGT	OtherNC	OtherO	OVT	PD	PDC	PKV	RE
General/Fixed Obstacle Removal	52	0%	0%	0%	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
					Direct										
CRF		0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Parcial benefit		$0	$0	$0	$86,193	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

Benefits from Countermeasures **$86,193**

Benefits from Countermeasures $86,193
Uniform Gradient Present Worth (G) $539 Increment due to traffic growth, starting on year 2
Uniform Gradient Present Series (A) $4,256 Annualized gradient at certain interest rate over the longest service life

$$G = \frac{P}{\frac{(1+i)^n - 1}{i^2(1+i)^n} - \frac{n}{i(1+i)^n}}$$

$$A = G\left[\frac{1}{i} - \frac{n}{(1+i)^n - 1}\right]$$

ANNUAL TOTAL COUNTERMEASURE BENEFIT	$90,449

INFORMATION ONLY

ROR	RT	SSD	SSO	T	TR	WP
50%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%	0%
0%	0%	0%	0%	0%	0%	0%

Direct

0.50	0.00	0.00	0.00	0.00	0.00	0.00
$0	$0	$0	$0	$0	$0	$0

APPENDIX E

Countermeasure Effectiveness & Crash Reduction Factors

APPENDIX E

Crash Reduction Factors for HSIP Program Projects

Intersection Locations

General

Improvement/Realignment/Reconstruction – CRF 30% for all crashes in rural areas and 50% for all crashes in urban areas. Intended for projects that modify the geometrics of the intersection.

Pavement

Widening and Resurfacing or Widening alone – Use 25% CRF for all crashes based on Kentucky study and review of other State practices.

Resurfacing alone – No Crash Reduction Factor identified. NCHRP Research Results Digest 255 shows a slight increase in total crashes with resurfacing in Illinois.

De-Slick (formerly known as skidproofing) – Techniques to improve surface friction require some showing that there is an existing surface friction deficiency. The preferred method is recent friction number testing by the Bureau of Materials and Physical Research. When improved friction qualities are required, one of several methods may be chosen, including improved friction surface mixture, surface grooving (longitudinal or transverse), or placement of a frictional surface treatment such as a seal coat. The designer must consider the acceptability of a given treatment in light of the class of highway, traffic levels, and expected life of the treatment. Use 45% CRF for reduction of wet pavement crashes.

Rumble Strips (Shoulder) – Shoulder rumble strips can adversely affect bicyclists use of the highway, and create noise that can be objectionable to adjacent property uses. The designer should weigh these concerns before proceeding with shoulder rumble strips. Use 30% CRF for fixed object, and run-off-the-road (including overturned off the road), crashes.

Rumble Strips (Centerline) – Centerline rumble strips pose similar concerns as shoulder rumble strips, and also may be objectionable where vehicles are allowed to cross the centerline for passing. Centerline rumble strips are considered experimental. Contact the Bureau of Safety Engineering.

Rumble Strips (Transverse) – CRF 25% for all crashes. Option to omit 2’ strip in mid-lane for motorcyclists. (Low Cost Safety Improvements)

Channelization – CRF 50% for Rear End, Head On, Sideswipe Same Direction, Sideswipe Opposite Direction, Left Turn, and Run-off-the-Road crashes.

Raised Reflective Marker Median – CRF 50% for Head On, Sideswipe Opposite Direction, and Left Turn crashes.

Rumble Strip Median – CRF 50% for Head On, Sideswipe Opposite Direction, and Left Turn crashes.

Thermoplastic or Preformed Tape Median – CRF 50% for Rear End, Head On, Sideswipe Same Direction, Sideswipe Opposite Direction, Left Turn, and Right Turn crashes

Painted Median -- CRF 50% for Rear End, Head On, Sideswipe Same Direction, Sideswipe Opposite Direction, Left Turn, and Right Turn crashes

Lane Addition – CRF 50% for Rear End, Sideswipe Same Direction, Left Turn, and Right Turn crashes.

Left Turn Lane – CRF 25% for each leg with an added left turn lane for Rear End, Sideswipe Same Direction, Sideswipe Opposite Direction, and Left Turn crashes. Includes improvements with throat widening for the receiving leg. (LCSI)

Right Turn Lane – CRF 25% for each leg with an added right turn lane for Rear End, Sideswipe Same Direction, and Right Turn crashes. (LCSI)

Bidirectional Left Turn Lane – CRF 50% for Rear End, Head On, Sideswipe Same Direction, Sideswipe Opposite Direction, and Left Turn crashes.

Left Turn Acceleration Lane – CRF 50% for Rear End, Sideswipe Same Direction, Sideswipe Opposite Direction, Angle, and Left Turn Crashes.

Right Turn Acceleration Lane – CRF 50% for Rear End, Sideswipe Same Direction, and Right Turn crashes.

Deceleration Lane – CRF 50% for Rear End, Sideswipe Same Direction, and Right Turn crashes.

One-Way Couple – CRF 50% for all crashes.

Install Roundabout Conversion of stop control intersection (single lane approach) to roundabout ,CRF 60% for all crashes in rural areas and 70% for all crashes in urban areas.

Install passing lane – For passing lane in one direction of travel, CRF 25% for all crashes. For passing lanes in both directions of travel, CRF 35% for all crashes.

Increase width of paved shoulder –Increase paved shoulder width up to 8ft, CRF 10% for all crashes.

Increase lane width – Increase lane width from 9 ft. or 10 ft. to 12 ft., CRF 10% for all crashes. No CRF for widening from 11 ft. to 12 ft.

Signing

Modernization – CRF 25% to update an existing system to current MUTCD, for all crashes. (LCSI)

Installation – CRF 40% to install MUTCD compliant signage for all crashes.

Speed Signing – CRF 40% for all crashes for warranted adjustments of speed limits and signage locations.

Advance Warning Signs – CRF 25% for all crashes. (LCSI)

Four Way Stop – CRF 50% for all crashes. Conversion of 2-way to 4-way stop. (LCSI)

Minor Leg Stop – CRF 40% for Angle, Left Turn, and Right Turn crashes.

Yield Sign – Conversion of uncontrolled movement to yield control, CRF 40% for Angle, Left Turn, and Right Turn crashes.

Changeable Message Signs – CRF 10% for all crashes.

Delineators – CRF 40% for all crashes.

Overhead Sign Truss – CRF 40% for Rear End and Sideswipe Opposite Direction crashes.

Signalization

Modernization – CRF 25% for Pedestrian, Fixed Object, Rear End, Sideswipe, Angle, Left Turn and Right Turn crashes.

Install Traffic Signals – CRF 23% for total crashes. CRF 67% for Right Angle crashes. CRF Negative 38% for rear end crashes.

Relocation of Signal Supports – CRF 25% for Fixed Object crashes.

Advance Warning with Flasher – CRF 15% for Overturn, Fixed Object, Rear End, Sideswipe Same Direction, Sideswipe Opposite Direction, Angle, Left Turn, Right Turn, and Run-off-the-Road crashes.

Red/Yellow Flashing Beacon – Not recommended.

Red Flashing Beacon – CRF 45% for right angle crashes. (LCSI)

Add Left Turn Phase with Left Turn Lane – CRF 35% for all crashes. (LCSI)

Add Left Turn Phase without Left Turn Lane – CRF 25% for all crashes. (LCSI)

Phase Adjustment – CRF 25% for all crashes.

Increase to 12 Inch Lens – CRF 25% for all crashes.

Add Traffic Actuation – CRF 25% for Rear End, Angle, Left Turn and Right Turn crashes.

Time Lane Control – CRF 25% for Head On and Sideswipe Opposite Direction crashes.

Optical Programmed – CRF 25% for Rear End, Angle, Left Turn and Right Turn crashes.

Add Pedestrian Controls – CRF 25% for Pedestrian and Bicyclist crashes.

Add Mast Arms and Signal Head per Lane – CRF 25% for Rear End, Angle, Left Turn and Right Turn crashes.

Safety Lighting – CRF 25% for all crashes, or 50% for nighttime crashes. (LCSI).

Install automated enforcement of red light violations – CRF 25% for Angle crashes. CRF negative 15% for Rear-End crashes.

Non-Intersection (Segment) Locations

Pavement Treatments

Widening and Resurfacing or Widening alone – Use 25% CRF for all crashes based on Kentucky study and review of other State practices.

Resurfacing alone – No Crash Reduction Factor identified. NCHRP Research Results Digest 255 shows a slight increase in total crashes with resurfacing in Illinois.

De-Slick (formerly known as skidproofing) – Techniques to improve surface friction require some showing that there is an existing surface friction deficiency. The preferred method is recent friction number testing by the Bureau of Materials and Physical Research. When improved friction qualities are required, one of several methods may be chosen, including improved friction surface mixture, surface grooving (longitudinal or transverse), or placement of a frictional surface treatment such as a seal coat. The designer must consider the acceptability of a given treatment in light of the class of highway, traffic levels, and expected life of the treatment. Use 45% CRF for reduction of wet pavement crashes.

Rumble Strips (Shoulder) – Shoulder rumble strips can adversely affect bicyclists use of the highway, and create noise that can be objectionable to adjacent property uses. The designer should weigh these concerns before proceeding with shoulder rumble strips. Use 30% CRF for fixed object, and run-off-the-road (including overturned off the road), crashes.

Rumble Strips (Centerline) – Centerline rumble strips pose similar concerns as shoulder rumble strips, and also may be objectionable where vehicles are allowed to cross the centerline for passing. Centerline rumble strips are considered experimental. Contact the Bureau of Safety Engineering.

Pavement Marking

General Pavement Marking – For installation of MUTCD pavement markings on an existing road not having pavement markings, use a CRF of 30%. This also applies for adding elements of pavement marking not included on an existing road (for example, adding center, edge or no-passing markings.)

Raised Reflective Markers – On some curved roadways, RRPM's are not recommended as an HSIP safety countermeasure. See the following tables for recommended CRF's depending on type of road, ADT, and curvature. For tangent sections use a CRF of 30% for nighttime crashes. When applying RRPM's under this policy and they will be omitted through such curves, apply some other means of curve delineation such as chevrons or delineators.

AADT (veh/day)	CRF for Nighttime Crashes	
	When Degree of Curve < or = 3.5	When Degree of Curve Is > 3.5
0 to 5000	Negative 16% (crashes increase)	Negative 43% (crashes increase)
5001 to 15000	1%	Negative 26% (crashes increase)
15001 to 20000	24%	Negative 3% (crashes increase)

Crash Reduction Factors for RRPM's on Two-Lane Highways

AADT (veh/day)	CRF for Nighttime Crashes
20000 or less	Negative 13% (crashes increase)
20001 to 60000	6%
Over 60000	33%

Crash Reduction Factors for RRPM's on Four-Lane Freeways

Railroad Crossing

Modification – CRF 50% for Train, Fixed Object, Rear End, and Run-off-the-Road crashes.

Gates – CRF 60% for Train, Fixed Object, Rear End, and Run-off-the-Road crashes.

Crossbucks – CRF 60% for Train and Fixed Object crashes.

Flashing lights – CRF 60% for Train, Fixed Object, Rear End, and Run-off-the-Road crashes.

Flashing Beacons – CRF -- 60% for Train, Fixed Object, Rear End, and Run-off-the-Road crashes.

Warning Bells – CRF -- 50% for Train crashes.

Pavement Markings – CRF 30% for Train, Rear End, and Run-off-the-Road crashes.

Warning Signs – Standard CRF 40% for Train, Fixed Object, Rear End, and Run-off-the-Road crashes.

Warning Signs – Special CRF 40% for Train, Fixed Object, Rear End, and Run-off-the-Road crashes.

Delineators – CRF 40% for Train, Fixed Object, and Run-off-the-Road crashes.

Safety Lighting – CRF 50% for Train, Fixed Object, Rear End, and Run-off-the-Road crashes.

Resurfacing – CRF 25% for Train, Fixed Object, Rear End, and Run-off-the-Road crashes.

Grade Separation – CRF 100% for All crashes.

Removal – CRF 100% for All crashes.
.

Bridge

General Repair – CRF 15% for Parked Vehicle, Head On, Sideswipe Opposite Direction, Sideswipe Same Direction, and Run-off-the-Road crashes.

Widen/Resurface – CRF 15% for Fixed Object, Head On, Sideswipe Opposite Direction, Sideswipe Same Direction, and Run-off-the-Road crashes.

Widening – CRF 15% for Fixed Object, Head On, Sideswipe Opposite Direction, Sideswipe Same Direction, and Run-off-the-Road crashes.

De-Slick – Formerly known as “Skidproofing”. CRF 45% for all wet pavement crashes.

Grooving – CRF 45% for all wet pavement crashes.

Frost/Ice Detectors - Sign – CRF 25% for CRF 15% for Fixed Object, Head On, Sideswipe Opposite Direction, Sideswipe Same Direction, and Run-off-the-Road crashes.

Frost/Ice Detectors - Radio – CRF 25% for CRF 15% for Parked Vehicle, Head On, Sideswipe Opposite Direction, Sideswipe Same Direction, and Run-off-the-Road crashes.

Guardrail – CRF 15% for fatality and injury crashes resulting from fixed objects, or run-off-the-road. Changed from crash reduction to crash severity reduction.

Separation between Pedestrians/Traffic – CRF 95% for pedestrian crashes.

Safety Lighting – CRF 50% for nighttime crashes.

Delineators – CRF 15% for fixed object and run-off-the-road crashes.

Impact Attenuators – CRF 70% for fatalities and injury crashes resulting from fixed object and run-off-the-road crashes. Changed from crash reduction to crash severity reduction.

Reconstruction – CRF 50% % for Fixed Object, Head On, Sideswipe Opposite Direction, Sideswipe Same Direction, and Run-off-the-Road crashes.

Curves

Realignment/Reconstruction – CRF 35% for Overturn, Fixed Object, Head On, Sideswipe Same Direction, Sideswipe Opposite Direction, and Run-off-the-Road crashes.

Superelevation – CRF's depend on the amount of superelevation deficiency (SD) corrected to bring the curve into compliance with geometric criteria. SD is the difference between the actual and optimal superelevation rate.

CRF = 0% for SD < 0.01 ft/ft.

CRF = 6(SD-0.01) X 100% for SD greater than 0.01 to 0.02   If SD = 0.0199, CRF = 6%

CRF = 6% + 3(SD-0.02) X 100% for SD over 0.02.

Daylighting – CRF 30% for Overturn, Fixed Object, Head On, Sideswipe Opposite Direction, Sideswipe Same Direction, and Run-off-the-Road. Daylighting is removing gutter on the inside edge of pavement and regrading shoulders to drain to the ditch.

Widening and Resurfacing or Widening alone – Use 25% CRF for all crashes based on Kentucky study and review of other State practices.

De-Slick (formerly known as skidproofing) – Techniques to improve surface friction require some showing that there is an existing surface friction deficiency. The preferred method is recent friction number testing by the Bureau of Materials and Physical Research. When improved friction qualities are required, one of several methods may be chosen, including improved friction surface mixture, surface grooving (longitudinal or transverse), or placement of a frictional surface treatment such as a seal coat. The designer must consider the acceptability of a given treatment in light of the class of highway, traffic levels, and expected life of the treatment. Use 45% CRF for reduction of wet pavement crashes.

Guardrail CRF 44% for fatal Run-off-the-road and fixed object crashes. CRF 47% for injury Run-off-the-road and fixed object crashes. Placing a guardrail affects values for fatal and injury crashes, but there might be an increment on PDO crashes. The overall CRF value for all crashes is 7%

Advance Warning Sign – CRF 20% for all crashes. This increment may be applied for each increment of improvement. For example, if the existing signage meets the requirements of MUTCD, then upgrading to double-up signing would provide a CRF of 20%. Further adding flashing amber beacons on the signs would provide a 20% CRF for the remaining crashes.

Chevrons or Delineators – CRF 40% for Overturn, Head-On, Sideswipe Opposite Direction, or Run-off-the-Road crashes.

Relocation – CRF 45% for all crashes. This is for relocation to another alignment designed to current criteria.

Roadside Safety

General/Fixed Obstacle Removal – CRF 50% for Fixed Object and Run-off-the-Road crashes for the removal of hazards within clear zone.

Curb Parking Removal – CRF 50% for Parked Vehicle, Rear End, and Run-off-the-Road crashes.

Guardrail – CRF 15% for fatality and injury crashes resulting from fixed objects, or run-off-the-road. Changed from crash reduction to crash severity reduction.

Utility Adjustment – CRF 32% for fatalities and 45% for injuries related to fixed object and run off the road crashes involving utility hazards (poles, etc.) for removal of these hazards from the clear zone.

Drainage Improvement – CRF 10% for all crashes. For drainage improvement to bring water encroachment into compliance with IDOT policies.

Shoulder Improvement – CRF 10% for Fixed Object and Run-off-the-Road crashes. Includes repair of paved shoulders, or restoring/placing aggregate shoulders to provide a cross slope meeting IDOT Standards and necessary slope matching.

Impact Attenuators – CRF 70% for fatalities and injuries crashes resulting from fixed object and run-off-the-road crashes. Changed from crash reduction to crash severity reduction.

Glare Shields – CRF 15% for Sideswipe Same Direction, Angle, and Run-off-the-Road crashes.

Fencing – CRF 15% for all crashes.

Other

Turnouts (Mailbox or other) – CRF 50% for crashes related to vehicles entering or exiting from the shoulder area, such as delivering mail.

Ramp Improvement – See curve countermeasures.

APPENDIX F

Safety Improvements – Service Life

APPENDIX F

SERVICE LIFE OF SAFETY IMPROVEMENTS

	INTERSECTION	SERVICE LIFE
01	**General**	
	AA – Improvement	15
	AB – Realignment	15
	AC – Reconstruction	15
02	**Pavement**	
	BA – Widen/Resurface	15
	BB – Widening	15
	BC – Resurfacing	10
	BD – Skid Proofing	5
	BE – Grooving	7
	BF – Rumble Stripping	3
	BG – Seal Coating	3
03	**Channelization**	
	CA – Raised Curb Median	15
	CB – Raised Reflector Median	7
	CC – Rumble Strip Median	10
	CD – Thermo-Plastic Tape	3
	CE – Paint	2
	CF – Lane Transition	15
	CG – Lane Addition	15
	CH – Left turn Lane/Throat Widening	15
	CI – Right Turn Lane	15
	CJ – Left Turn Lane	15
	CK – Bi-Directional Turn Lane	15
	CL – Left Turn Acceleration	15
	CM – Right Turn Acceleration Lane	15
	CN – Deceleration Lane	15
	CO – One-Way Couple	15
04	**Signing**	
	DA – Modernization	6
	DB – Installation	6
	DC – Speed	6
	DD – Advanced Warning	6
	DE – Street Name	6
	DF – Four-Way Stop	5
	DG – Minor Leg Stop	5

	DH – Yield	5
	DI – Changeable Message	6
	DJ – No-Turn-On-Red	4
	DK – Delineators	4
	DL – Flexible Post	4
	DM – Overhead Truss	15
05	**Signalization**	
	EA – Modernization	10
	EB – Installation	15
	EC – Relocation	15
	ED – Warning Flasher	10
	EF – Red Flashing Beacon	10
	EG – Left Turn with Lane	10
	EH – Left Turn without Lane	15
	EI – Phase Adjustment	10
	EJ – Twelve Inch Lens	10
	EK – Traffic Actuated	10
	EL – Time Lane Control	10
	EM – Optical Programmed	10
	EN – Pedestrian Control	10
	EO – Mast Arming	15
	EP – Safety Lighting	15
	NON-INTERSECTION	**SERVICE LIFE**
06	**Pavement Treatments**	
	FA – Widen/Resurface	15
	FB – Widening	15
	FC – Resurfacing	10
	FD – Skid Proofing	5
	FE – Grooving	7
	FF – Rumble Stripping	3
	FG – Seal Coating	3
07	**Pavement Marking**	
	GA – General Pavement Marking	1
	GB – Center Line	1
	GC – Edge Line	1
	GD – Raised Reflector	4
	GE – No-Pass Stripping	1
	GF – Thermo-Plastic Tape	3
	GG – Paint	1

08	**Railroad Crossing**		
	HA – Modification	15	
	HB –Gates	15	
	HC – Crossbucks	15	
	HD – Flashing Lights	15	
	HE – Flashing Beacons	15	
	JH – Warning Bells	15	
	HG – Pavement Markings	2	
	HH – Warning Signs-Standard	2	
	HI – Warning Signs-Special	5	
	HJ – Delineators	4	
	HK – Safety Lighting	15	
	HL – Resurfacing	10	
	HM – Grade Separation	20	
	HN – Removal	20	
09	**Bridge**		
	IA – General Repair	10	
	IB – Widen/Resurface	15	
	IC – Widening	15	
	ID – Resurfacing	10	
	IE – Skid Proofing	5	
	IF – Grooving	7	
	IG – Frost/Ice Detectors –Sign	10	
	IH – Frost/Ice Detectors-Radio	10	
	II – Guardrail	10	
	IJ – Pedestrian Handrail	15	
	IK – Safety Lighting	15	
	IL – Delineators	4	
	IM – Impact Attenuators	3	
	IN – Reconstruction	20	
	IO – Removal	20	
10	**Curve**		
	JA – Realignment	15	
	JB – Reconstruction	15	
	JC – Superelevation	15	
	JD – Daylighting	15	
	JE – Widen/Resurface	15	
	JF – Widening	15	
	JG – Resurfacing	10	
	JH – Skid Proofing	5	
	JI – Grooving	7	
	JJ – Guardrail	10	

	JK – Advance Warning Sign	5
	JL – Warning Flasher	10
	JM – Delineators	4
	JN – Relocation	15
11	**Roadside Safety**	
	KA – General Obstacle Removal	20
	KB – Fixed Object Removal	20
	KC – Fringe Parking Removal	20
	KD – Bike Path Removal	20
	KE – Guardrail Installation	10
	KF – Utility Adjustment	15
	KG – Drainage Improvement	10
	KH – Shoulder Repair	5
	KI – Slope Stabilization	10
	KJ – Impact Attenuators	3
	KK – Glare Shields	10
	KL – Fencing	10
	KM – Access Control	20
12	**Other**	
	OA – Turnabout	15
	OB – Ramp Improvement	15
	OC – Right of Way	20

APPENDIX G

HSIP Candidate Form

Illinois Department of Transportation

HSIP Candidate Form

FY

ID: | Contract: | Award Date: | Completion Date:

District: | County: | City:

Key route: | Marked route:

Road Name: | Intersecting Roadway: ☐ N/A

Length: ☐ N/A | Mile station: to

Location Description:

☐ Rural | ☐ Urban | Lanes:

AADT(Segment): | Total Entering AADT (Intersection): | Speed Limit: mph

Friction Test Results: ☐ N/A | Lighting Present: ☐ Y ☐ N

CHSP Emphasis Area(s): ☐ District Documentation ☐ Systematic Improvements ☐ N/A

Peer Group: ☐ N/A

Other:

Crashes Details

Year	Total Crashes	Fatal Crashes	Fatalities	A-Injury Crashes	A-Injuries	B-Injury Crashes	B-Injuries	C-Injury Crashes	C-Injuries	PDO	Wet-Weather Crashes	Darkness (Not lighted) Crashes
Total												

Location Description:

Problem Description:

Previous Safety Improvements:

Collision Diagram: ☐ Y ☐ N | Images: ☐ Y ☐ N

Predominant Crash Types:

Proposed Improvement(s):

Estimated Project Cost ($000's): $ | Benefit-Cost Ratio:

Local Projects:

Annual Fatal Crash Rate (Fatal Crashes/100 Miles): | Annual A-Injury Crash Rate (A-Injury Crashes/100 Miles):

Local Roads Rural Functional Class:

Approved: | Central HSIP Approval Date:

Signed:

State Safety Engineer

Funding: ☐ HSIP ☐ HRRR ☐ RAIL

Comment:

Distribution: ☐ OPP ☐ District ☐ BSE ☐ LRS ☐ BDE

APPENDIX H

Example of Submittal Package

APPENDIX G
HSIP CANDIDATE FORM

ID: 99999

District: 1	***County:*** DuPage	***City:*** Warrenville
Key route:	***Marked route:*** IL 59 & BATAVIA RD	
Route: IL Route 59	***Intersecting Roadway:*** Batavia Road	☐ N/A
Length: ☒ N/A		***Milestation:*** 22.40

Location Description: Signalized intersection (part of interconnected system along IL 59) with protected-permitted left turn phasing in all four directions. Northbound & southbound approaches have 5 lanes with 8' paved shoulders adjacent to curb & gutter; left turn lanes are preceded by a corrugated concrete median that continues through the taper and the ramps up to a concrete barrier median adjacent to the storage portion of the bay. Eastbound and westbound approaches have a 3 lane cross-section with exclusive right turn lanes at the intersection. Highly commercialized area with two gas stations on NW and SW corners (many driveways)

☐ ***Rural*** ☒ ***Urban***	***Lanes:*** 5
AADT: 42,600 North leg; 39,500 South leg	***Speed Limit:*** 45 mph on IL59; 35 mph on Batavia
Friction Test Results: ☒ N/A	***Lighting:*** ☐ Y ☒ N Except 1 luminaire on the SE corner

CHSP Emphasis Area(s): Intersections ☒ District Knowledge ☐ Systematic Improvements ☐ N/A

HALIS Peer Group: 2-divided Highway, No Access Control ☐ N/A

Critical Values Exceeded: ☐ Freq ☐ Rate ☐ EPDO

Other:

		Crashes Details										
Year	**Total Crashes**	**Fatal Crashes**	**Fatalities**	**A-Injury crashes**	**A-Injuries**	**B-Injury Crashes**	**B-Injuries**	**C-Injury Crashes**	**C-Injuries**	**PDO**	**Wet-Weather**	**Darkness (not lighted)**
2001	15	0	0	2	2	1	2	2	2	10	4	2
2002	22	1	1	0	0	1	1	6	5	14	4	7
2003	18	0	0	1	1	1	1	3	2	13	3	5
2004	No data available											
2005	No data available											
Total	55	1	1	3	3	3	4	11	9	37	11(20%)	14(25%)

Problem Description: Pattern of North/South left turning collisions (permissive left turns); Needs conversion to protected-only phasing with additional storage for N/S left turn bays.

Previous Safety Improvements: None known

Collision Diagram: ☒ Y ☐ N ***Images:*** ☒ Y ☐ N

Predominant Crash Types: NB & SB left turning and rear-end

Proposed Improvement(s): Removal of corrugated median and extend storage left turn bays on North and South legs to accommodate protected-only phasing(Left turn on Arrow Only) for NB & SB IL59.

Estimated Project Cost: $140,000 ***Benefit-Cost Ratio:*** 7.88

Local Projects:
Annual Fatality rate/100 Miles: Annual Crash A Injury Rate/100 Miles:

Local Roads Rural Functional Class:

Approved: ***Central HSIP Approval Date:***

Signed:
State Safety Engineer ***Funding:***

Comment:

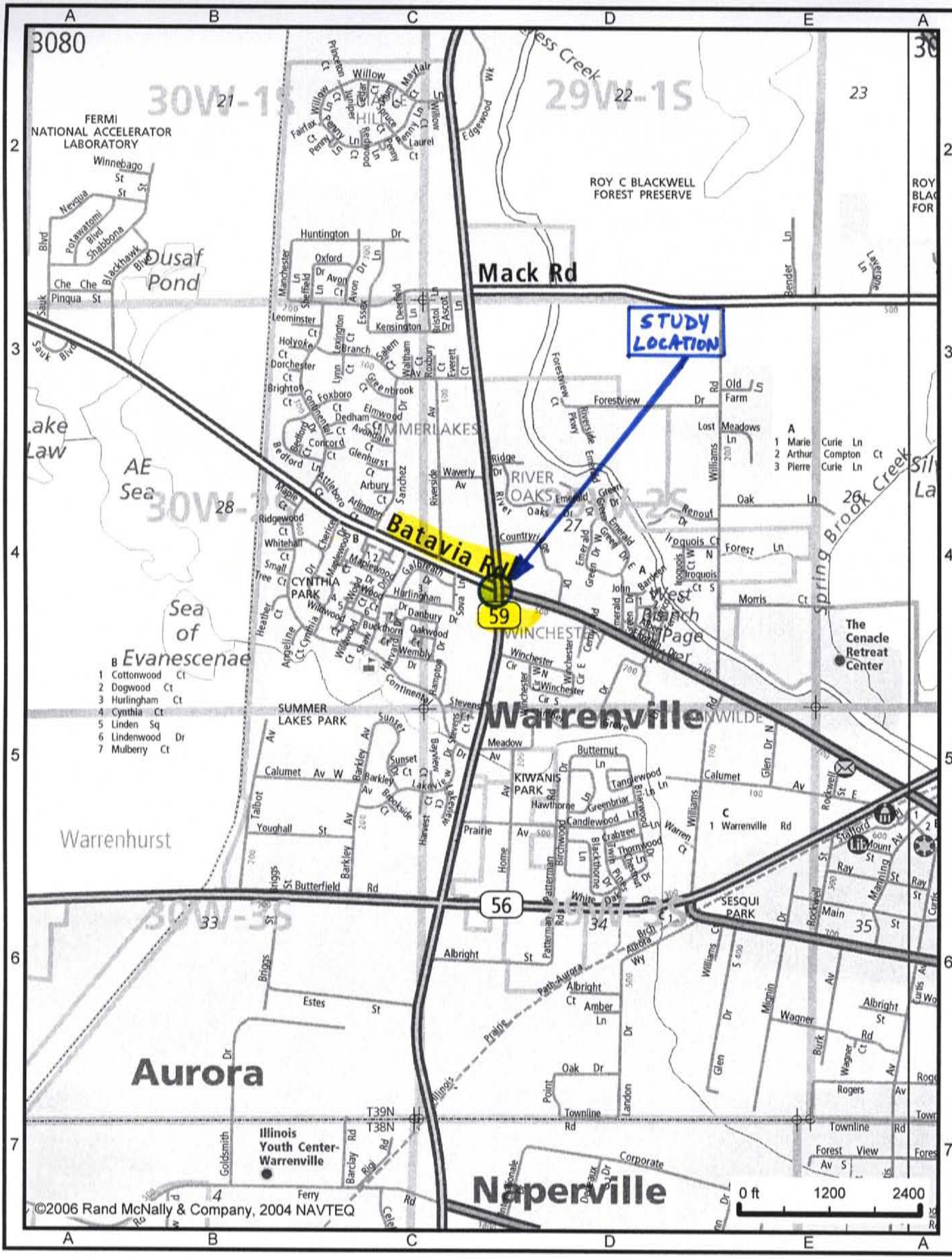
Distribution: ☐ OPP ☐ District ☐ BSE ☐ LRS ☐ BDE

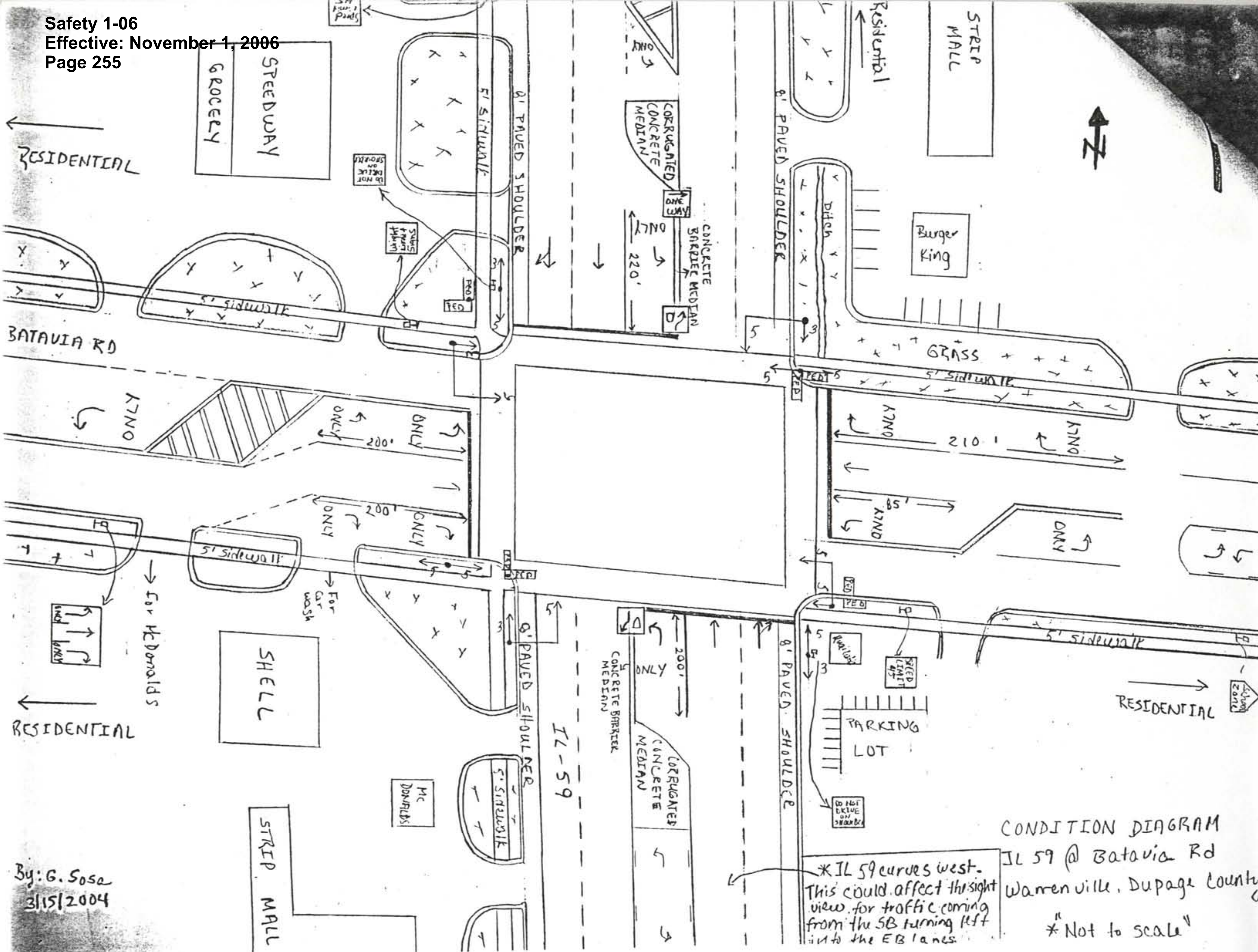
SAMPLE

BENEFIT-COST ANALYSIS						
				Countermeasure 1		
Project No.	999999				Date	9/7/2006
Location	Illinois 59		and	Batavia Road	Prepared by	
Type	Intersection				DEV	50000
Crash data:	From	2001	to	2003	Total yrs	3
Total crashes:	55					
Safety improvement being considered:	NB&SB Left turn Extension					
Estimated cost	140	(Thousand)				
Estimated service life	15	years				
Estimated overall crash/severity reduction factor	50	percent				
Crash type affected by safety improvement:	Left turning & Rear-end					
Number of crashes of this type along this corridor:	36					
Fatal crashes	0	# fatals	0	x	$3,760,000	$0
Injury crashes (A+B+C)	12	# major injuries	2	x	$188,000	$376,000
	0	# minor injuries	1	x		$0
	0	# possible injuries	9	x		$0
PDO crashes	24			x		$0
Total crashes affected by this safety improvement:	36				Total loss	$376,000
Cost per crash	$10,444					
Crash rate	0.66	Crashes per MEV				
B/C analysis						
Estimated traffic volume	321.09	MEV				
Total crash loss without improvement	$2,205,116					
Total crash benefit	$1,102,558					
B/C ratio	7.88					
	Crashes reduced					
Fatals	0.00	30.00	Major Injuries			
	Crashes remaining					
Fatals	0.00	0.00	Major Injuries			

SAMPLE

This spreadsheet is used for B/C Analysis at spot locations.The numbers used are an example for the analysis process.


3080
Mack Rd
STUDY LOCATION
Batavia Rd
59
56
Warrenville
Aurora
Naperville
Warrenhurst
FERMI NATIONAL ACCELERATOR LABORATORY
ROY C BLACKWELL FOREST PRESERVE
SUMMER LAKES PARK
KIWANIS PARK
SESQUI PARK
CYNTHIA PARK
RIVER OAKS
The Cenacle Retreat Center
Illinois Youth Center-Warrenville
30W-1S
29W-1S
30W-2S
30W-3S
B
1 Cottonwood Ct
2 Dogwood Ct
3 Hurlingham Ct
4 Cynthia Ct
5 Linden Sq
6 Lindenwood Dr
7 Mulberry Ct
A
1 Marie Curie Ln
2 Arthur Compton Ct
3 Pierre Curie Ln
C
1 Warrenville Rd
0 ft 1200 2400
©2006 Rand McNally & Company, 2004 NAVTEQ


CONDITION DIAGRAM
IL 59 @ Batavia Rd
Warrenville, Dupage County
* "Not to scale"
*IL 59 curves west. This could affect the sight view for traffic coming from the SB turning left into the EB lanes.
By: G. Sosa
3/15/2004
BATAVIA RD
IL-59
RESIDENTIAL
SPEEDWAY
GROCERY
SHELL
Burger King
STRIP MALL
PARKING LOT
GRASS
5' sidewalk
8' PAVED SHOULDER
CONCRETE BARRIER MEDIAN
CORRUGATED CONCRETE MEDIAN
ONLY
200'
210'
220'
85'
Ditch
For McDonalds
For Car wash
MC DONALDS


RIVERSIDE
SOVA
BATAVIA
N
STATE HWY 59
STATE HWY 59
COUNTRY RIDGE
WINCHESTER
BATAVI
© 2005 AE, LLC
© 2005 GDT, Inc


BATAVIA
N
© 2005 AE, LLC
© 2005 GDT, Inc

South Bound IL 59
Approaching Batavia Rd
Warrenville, DuPage County
3/2/2004

South Bound IL 59
Approaching Batavia Rd
Warrenville, DuPage County
3/2/2004

South Bound IL 59
Approaching Batavia Rd
Warrenville, DuPage County
3/2/2004

South Bound IL 59
Approaching Batavia Rd
Warrenville, DuPage County
3/2/2004

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Approaching Batavia Rd
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Approaching Batavia Rd
Warrenville, DuPage County
3/2/2004

North Bound IL 59
Approaching Batavia Rd
Warrenville, DuPage County
3/2/2004

North Bound IL 59
Approaching Batavia Rd
Warrenville, DuPage County
3/2/2004

East Bound Batavia Rd
Approaching IL 59
Warrenville, DuPage County
3/2/2004

East Bound Batavia Rd
Approaching IL 59
Warrenville, DuPage County
3/2/2004

East Bound Batavia Rd
Approaching IL 59
Warrenville, DuPage County
3/2/2004

East Bound Batavia Rd
Approaching IL 59
Warrenville, DuPage County
3/2/2004

West Bound Batavia Rd
Approaching IL 59
Warrenville, DuPage County
3/2/2004

West Bound Batavia Rd
Approaching IL 59
Warrenville, DuPage County
3/2/2004

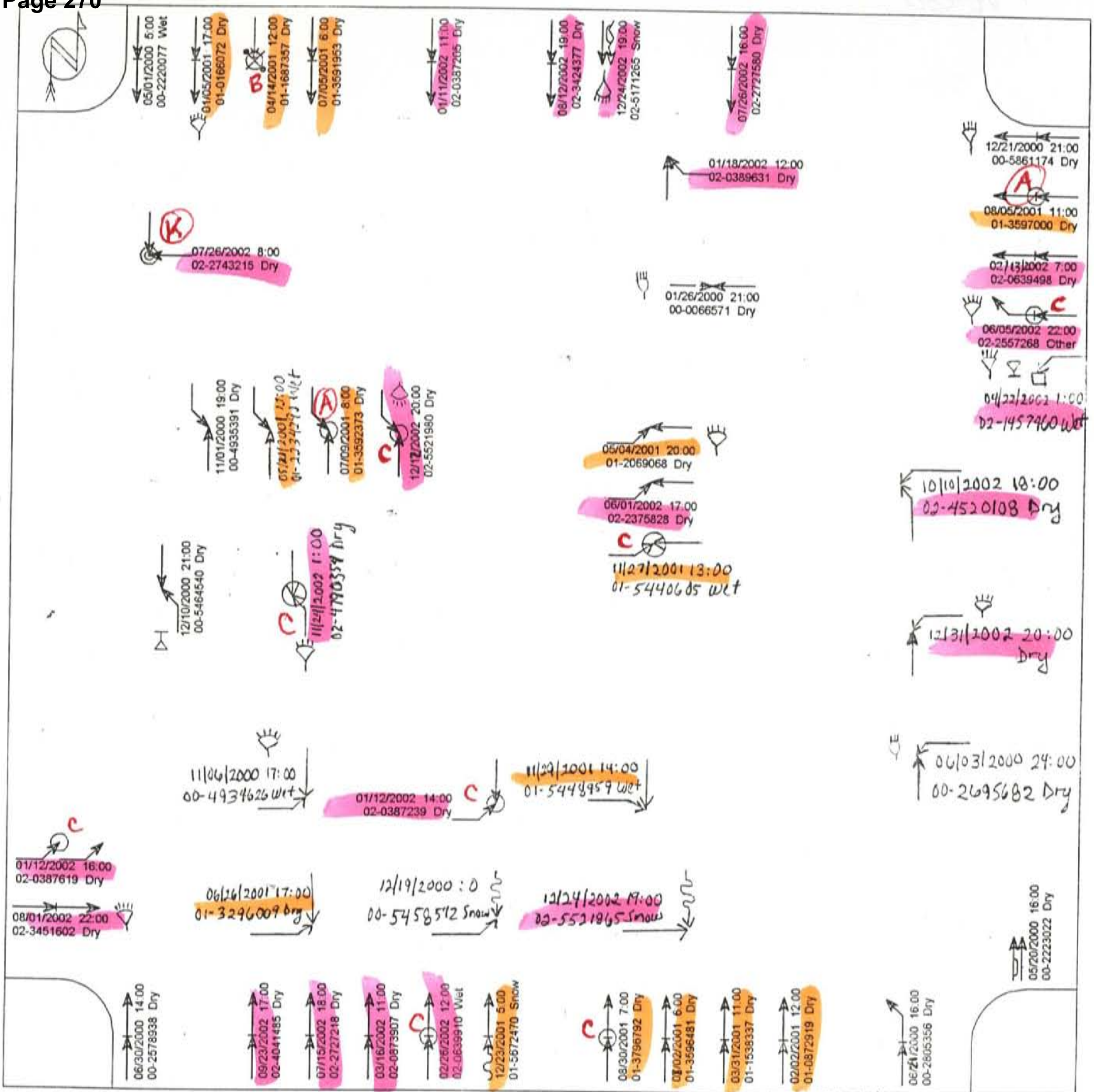
West Bound Batavia Rd
Approaching IL 59
Warrenville, DuPage County
3/2/2004

West Bound Batavia Rd
Approaching IL 59
Warrenville, DuPage County
3/2/2004

West Bound Batavia Rd
Approaching IL 59
Warrenville, DuPage County
3/2/2004

Years: 2000-2002
48 Accidents

IL 59 @ Batavia Rd
Warrenville, DuPage County

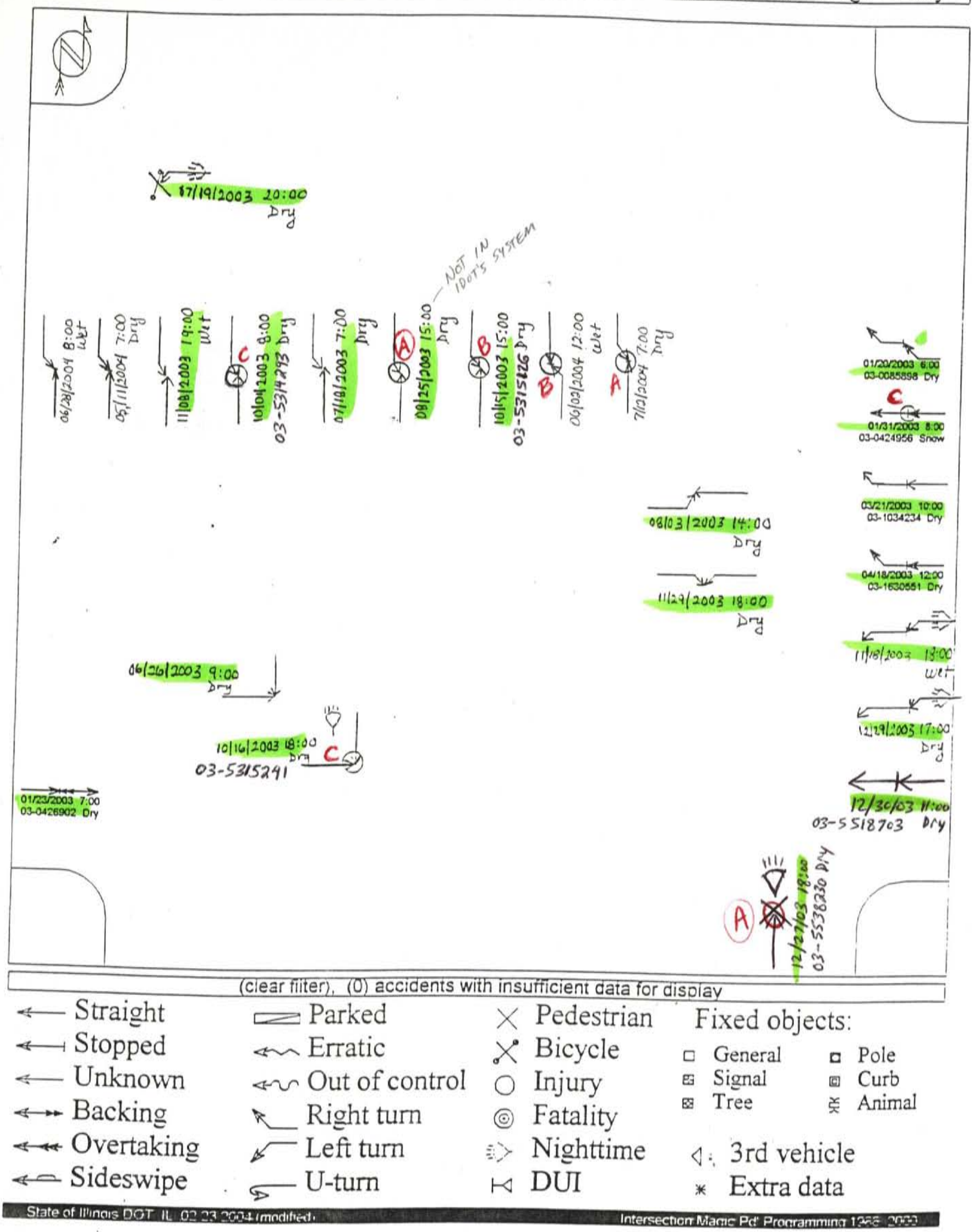


Accidents with missing data (0)

2000 - 11 crashes
2001 - 15 crashes
2002 - 22 crashes

Years: 2003-July 2004
23 accidents

IL 59 @ Batavia Rd
Warrenville, DuPage County



2003 - 19 crashes
2004 - 4 crashes (JULY 2004) - Provided by LOCAL PD (ONLY N/S LT TURNING)

GCA-R011 GCA-R016

ILLINOIS DEPARTMENT OF TRANSPORTATION

02/18/2004
Page 1

GIS Crash Details Report

(D) IL 59 @ Batavia Road (Years: 2000-2002)

Route	Mile	Case Number	Collision Type	Surface /Weather	Crash Date /Time		Directior	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
IL 059	22.40	02-0387205	REAR END	DRY	01/11/02	**Veh 1:**	SOUTH	NORMAL	CAR	Straight ahead	0	0	FRI	DAY
				CLEAR	11:00	**Veh 2:**	SOUTH	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	02-0387239	TURNING	DRY	01/12/02	**Veh 1:**	EAST	NORMAL	CAR	Turning left	0	1	SAT	DAY
				CLEAR	14:00	**Veh 2:**	SOUTH	NORMAL	CAR	Straight ahead				
IL 059	22.40	02-0387619	ANGLE	DRY	01/12/02	**Veh 1:**	EAST	NORMAL	CAR	Slow/stop-left turn	0	2	SAT	DAY
				CLEAR	16:00	**Veh 2:**	EAST	NORMAL	VAN	Slow/stop-left turn				
IL 059	22.40	02-0389631	TURNING	DRY	01/18/02	**Veh 1:**	NORTH	NORMAL	CAR	Straight ahead	0	0	FRI	DAY
				CLEAR	12:00	**Veh 2:**	WEST	NORMAL	CAR	Turning right				
IL 059	22.40	02-0639498	REAR END	DRY	02/06/02	**Veh 1:**	WEST	NORMAL	CAR	Straight ahead	0	0	WED	DAY
				CLEAR	07:00	**Veh 2:**	WEST	NORMAL	PICKUP	Slow/stop in traffic				
IL 059	22.40	02-0639910	REAR END	WET	02/26/02	**Veh 1:**	NORTH	NORMAL	PICKUP	Straight ahead	0	1	TUE	DAY
				SNOW	12:00	**Veh 2:**	NORTH	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	02-0873907	REAR END	DRY	03/16/02	**Veh 1:**	NORTH	NORMAL	CAR	Straight ahead	0	0	SAT	DAY
				CLEAR	11:00	**Veh 2:**	NORTH	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	02-1457460	FIXED OBJECT	WET	04/22/02	**Veh 1:**	SOUTH	ALCOHOL	CAR	Turning left	0	0	MON	NIGHT
				RAIN	01:00	**Veh 2:**								
IL 059	22.40	02-2375828	TURNING	DRY	06/01/02	**Veh 1:**	EAST	NORMAL	CAR	Turning left	0	0	SAT	DAY
				CLEAR	17:00	**Veh 2:**	WEST	NORMAL	CAR	Straight ahead				
IL 059	22.40	02-2557268	REAR END	OTHER	06/05/02	**Veh 1:**	WEST	OTHER	CAR	Straight ahead	0	1	WED	LIGHTED
				OTHER	22:00	**Veh 2:**	WEST	OTHER	CAR	Slow/stop-right turn				
IL 059	22.40	02-2727218	REAR END	DRY	07/15/02	**Veh 1:**	NORTH	NORMAL	PICKUP	Starting in traffic	0	0	MON	DAY
				CLEAR	18:00	**Veh 2:**	NORTH	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	02-2727580	REAR END	DRY	07/26/02	**Veh 1:**	SOUTH	NORMAL	CAR	Straight ahead	0	0	FRI	DAY
				CLEAR	16:00	**Veh 2:**	SOUTH	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	02-2743215	ANGLE	DRY	07/26/02	**Veh 1:**	WEST	OTHER	CAR	Straight ahead	1	1	FRI	DAY
				CLEAR	08:00	**Veh 2:**	SOUTH	OTHER	PICKUP	Straight ahead				
IL 059	22.40	02-3424377	REAR END	DRY	08/12/02	**Veh 1:**	SOUTH	NORMAL	CAR	Changing lanes	0	0	MON	DAY
				CLEAR	19:00	**Veh 2:**	SOUTH	NORMAL	CAR	Slow/stop in traffic				

ILLINOIS DEPARTMENT OF TRANSPORTATION

GIS Crash Details Report

(D) IL 59 @ Batavia Road (Years: 2000-2002)

Route	Mile	Case Number	Collision Type	Surface /Weather	Crash Date /Time		Directioı	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
IL 059	22.40	02-3451602	REAR END	DRY	08/01/02	Veh 1:	EAST	NORMAL	CAR	Slow/stop in traffic	0	0	THU	LIGHTED
				CLEAR	22:00	Veh 2:	EAST	NORMAL	CAR	Straight ahead				
IL 059	22.40	02-4041485	REAR END	DRY	09/23/02	Veh 1:	NORTH	NORMAL	CAR	Straight ahead	0	0	MON	DAY
				CLEAR	17:00	Veh 2:	NORTH	NORMAL	PICKUP	Slow/stop in traffic				
IL 059	22.40	02-4520108	TURNING	DRY	10/10/02	Veh 1:	WEST	NORMAL	VAN	Turning left	0	0	THU	DAY
				CLEAR	18:00	Veh 2:								
IL 059	22.40	02-4790354	TURNING	DRY	11/24/02	Veh 1:	NW	NORMAL	CAR	Turning left	0	1	SUN	LIGHTED
				CLEAR	01:00	Veh 2:								
IL 059	22.40	02-5171265	SIDESWIPE-SAME DIR	SNOW	12/24/02	Veh 1:	SOUTH	NORMAL	CAR	Avoiding	0	0	TUE	LIGHTED
				SNOW	19:00	Veh 2:	SOUTH	NORMAL	VAN	Slow/stop in traffic				
IL 059	22.40	02-5521865	ANGLE	SNOW	12/24/02	Veh 1:	SOUTH	NORMAL	CAR	Skidding/Control Loss	0	0	TUE	LIGHTED
				SNOW	19:00	Veh 2:	SOUTH	NORMAL	CAR	Skidding/Control Loss				
IL 059	22.40	02-5521980	TURNING	DRY	12/17/02	Veh 1:	SOUTH	NORMAL	CAR	Turning left	0	1	TUE	NIGHT
				CLEAR	20:00	Veh 2:	NORTH	NORMAL	SUV	Straight ahead				
IL 059	22.40	01-0166072	REAR END	DRY	01/05/01	Veh 1:	SOUTH	NORMAL	CAR	Slow/stop in traffic	0	0	FRI	LIGHTED
				CLEAR	17:00	Veh 2:	SOUTH	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	01-0872919	REAR END	DRY	02/02/01	Veh 1:	NORTH	NORMAL	CAR	Unknown/NA	0	0	FRI	DAY
				CLEAR	12:00	Veh 2:	NORTH	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	01-1538337	REAR END	DRY	03/31/01	Veh 1:	NORTH	NORMAL	CAR	Straight ahead	0	0	SAT	DAY
				CLEAR	11:00	Veh 2:	NORTH	NORMAL	SUV	Straight ahead				
IL 059	22.40	01-1687357	PEDALCYCLIST	DRY	04/14/01	Veh 1:	SOUTH	NORMAL	PICKUP	Other	0	2	SAT	DAY
				CLEAR	12:00	Veh 2:								
IL 059	22.40	01-2069068	TURNING	DRY	05/04/01	Veh 1:	EAST	NORMAL	CAR	Turning left	0	0	FRI	LIGHTED
				CLEAR	20:00	Veh 2:	WEST	NORMAL	SUV	Straight ahead				
IL 059	22.40	01-2234290	TURNING	WET	05/21/01	Veh 1:	EAST	NORMAL	PICKUP	Turning left	0	0	MON	DAY
				RAIN	12:00	Veh 2:	NORTH	NORMAL	CAR	Straight ahead				
IL 059	22.40	01-3296009	TURNING	DRY	06/26/01	Veh 1:	SOUTH	OTHER	CAR	Straight ahead	0	0	TUE	DAY
				CLEAR	17:00	Veh 2:	NE	NORMAL	CAR	Turning left				

ILLINOIS DEPARTMENT OF TRANSPORTATION

GIS Crash Details Report

(D) IL 59 @ Batavia Road (Years: 2000-2002)

Route	Mile	Case Number	Collision Type	Surface /Weather	Crash Date /Time		Directior	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
IL 059	22.40	01-3591953	REAR END	DRY	07/05/01	Veh 1:	SOUTH	NORMAL	CAR	Straight ahead	0	0	THU	DAY
				CLEAR	06:00	Veh 2:	SOUTH	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	01-3592373	TURNING	DRY	07/09/01	Veh 1:	SE	NORMAL	CAR	Turning left	0	1	MON	DAY
				CLEAR	08:00	Veh 2:	NORTH	NORMAL	CAR	Straight ahead				
IL 059	22.40	01-3596481	REAR END	DRY	07/02/01	Veh 1:	NORTH	NORMAL	TRUCK	Straight ahead	0	0	MON	DAY
				CLEAR	06:00	Veh 2:	NORTH	NORMAL	VAN	Starting in traffic				
IL 059	22.40	01-3597000	REAR END	DRY	08/05/01	Veh 1:	WEST	NORMAL	CAR	Straight ahead	0	1	SUN	DAY
				CLEAR	11:00	Veh 2:	WEST	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	01-3796792	REAR END	DRY	08/30/01	Veh 1:	NORTH	NORMAL	SUV	Straight ahead	0	2	THU	DAY
				CLEAR	07:00	Veh 2:	NORTH	NORMAL	VAN	Straight ahead				
IL 059	22.40	01-5440605	TURNING	WET	11/27/01	Veh 1:	NE	ILLNESS	CAR	Turning left	0	1	TUE	DAY
				CLEAR	13:00	Veh 2:	NORTH	NORMAL	SUV	Straight ahead				
IL 059	22.40	01-5448459	TURNING	WET	11/29/01	Veh 1:	SE	NORMAL	CAR	Turning right	0	0	THU	DAY
				RAIN	14:00	Veh 2:	SOUTH	NORMAL	CAR	Straight ahead				
IL 059	22.40	01-5672470	REAR END	SNOW	12/23/01	Veh 1:	NORTH	NORMAL	PICKUP	Skidding/Control Loss	0	0	SUN	DUSK
				SNOW	05:00	Veh 2:	NORTH	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	00-0066571	HEAD-ON	DRY	01/26/00	Veh 1:	EAST	NORMAL	CAR	Straight ahead	0	0	WED	LIGHTED
				CLEAR	21:00	Veh 2:	WEST	NORMAL	CAR	Straight ahead				
IL 059	22.40	00-2220077	REAR END	WET	05/01/00	Veh 1:	SOUTH	NORMAL	CAR	Straight ahead	0	0	MON	DAWN
				RAIN	05:00	Veh 2:	SOUTH	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	00-2223022	SIDESWIPE-SAME DIR	DRY	05/20/00	Veh 1:	NORTH	NORMAL	CAR	Changing lanes	0	0	SAT	DAY
				CLEAR	16:00	Veh 2:	NORTH	NORMAL	SUV	Straight ahead				
IL 059	22.40	00-2578938	REAR END	DRY	06/30/00	Veh 1:	NORTH	NORMAL	SUV	Straight ahead	0	0	FRI	DAY
				CLEAR	14:00	Veh 2:	NORTH	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	00-2695682	TURNING	DRY	06/03/00	Veh 1:	SW	OTHER	CAR	Turning left	0	0	SAT	NIGHT
				CLEAR	00:00	Veh 2:	NORTH	NORMAL	CAR	Straight ahead				
IL 059	22.40	00-2805356	REAR END	DRY	06/21/00	Veh 1:	NW	NORMAL	CAR	Slow/stop-left turn	0	0	WED	DAY
				CLEAR	16:00	Veh 2:	NORTH	NORMAL	CAR	Straight ahead				

ILLINOIS DEPARTMENT OF TRANSPORTATION

GIS Crash Details Report

(D) IL 59 @ Batavia Road (Years: 2000-2002)

Route	Mile	Case Number	Collision Type	Surface /Weather	Crash Date /Time		Directior	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
IL 059	22.40	00-4934626	TURNING	WET	11/06/00	**Veh 1:**	NORTH	NORMAL	CAR	Turning left	0	0	MON	NIGHT
				RAIN	17:00	**Veh 2:**	NORTH	NORMAL	CAR	Straight ahead				
IL 059	22.40	00-4935391	TURNING	DRY	11/01/00	**Veh 1:**	SOUTH	NORMAL	SUV	Turning left	0	0	WED	LIGHTED
				CLEAR	19:00	**Veh 2:**	NORTH	NORMAL	SUV	Straight ahead				
IL 059	22.40	00-5458542	ANGLE	SNOW	12/19/00	**Veh 1:**	NE	NORMAL	CAR	Skidding/Control Loss	0	0	TUE	LIGHTED
				SNOW	00:00	**Veh 2:**	SOUTH	NORMAL	CAR	Slow/stop-left turn				
IL 059	22.40	00-5464540	TURNING	DRY	12/10/00	**Veh 1:**	NW	ALCOHOL	CAR	Turning left	0	0	SUN	LIGHTED
				CLEAR	21:00	**Veh 2:**	SOUTH	NORMAL	CAR	Straight ahead				
IL 059	22.40	00-5861174	REAR END	DRY	12/21/00	**Veh 1:**	WEST	NORMAL	CAR	Straight ahead	0	0	THU	LIGHTED
				CLEAR	21:00	**Veh 2:**	WEST	NORMAL	CAR	Slow/stop in traffic				

Total Injuries: 15 **Total Fatalities: 1** **Total Crashes: 47**

GCA-R011 GCA-R016

ILLINOIS DEPARTMENT OF TRANSPORTATION

02/23/2004
Page 1

GIS Crash Details Report

(D) IL 59 @ Batavia Rd (Years: Jan.-Aug.2003)

Route	Mile	Case Number	Collision Type	Surface /Weather	Crash Date /Time		Directior	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
IL 059	22.40	03-0085898	REAR END	DRY	01/20/03	**Veh 1:**	WEST	NORMAL	PICKUP	Slow/stop-right turn	0	0	MON	DAWN
				CLEAR	06:00	**Veh 2:**	WEST	NORMAL	PICKUP	Slow/stop-right turn				
IL 059	22.40	03-0424956	REAR END	SNOW	01/31/03	**Veh 1:**	WEST	NORMAL	SUV	Slow/stop in traffic	0	1	FRI	DAY
				SNOW	08:00	**Veh 2:**	WEST	NORMAL	VAN	Slow/stop in traffic				
IL 059	22.40	03-0426902	REAR END	DRY	01/23/03	**Veh 1:**	EAST	NORMAL	CAR	Backing	0	0	THU	DAY
				CLEAR	07:00	**Veh 2:**	EAST	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	03-1034234	TURNING	DRY	03/21/03	**Veh 1:**	WEST	NORMAL	CAR	Turning on red	0	0	FRI	DAY
				CLEAR	10:00	**Veh 2:**	WEST	NORMAL	CAR	Slow/stop in traffic				
IL 059	22.40	03-1630551	REAR END	DRY	04/18/03	**Veh 1:**	WEST	NORMAL	CAR	Straight ahead	0	0	FRI	DAY
				CLEAR	12:00	**Veh 2:**	WEST	NORMAL	CAR	Slow/stop-right turn				

Total Injuries: 1 **Total Fatalities: 0** **Total Crashes: 5**

ILLINOIS DEPARTMENT OF TRANSPORTATION

GIS Crash Report Details

(D) IL 59 @ Batavia Rd (2004 Data)

Route	Mile	Case ID #	Collision Type	Surface /Weather	Crash Date Time		Direction	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
059	22.40	04-0361594	Sideswipe Same Dir	Dry Clear	01/07/04/ 11:00	Veh_1 Veh_2	West West	Other/Unkno Other/Unkno	Van/Mini-Van SUV		0	0	WED	Daylight
059	22.40	04-0362535	Rear End	Wet Clear	01/17/04/ 15:00	Veh_1 Veh_2	North North	Normal Normal	SUV Passenger		0	0	SAT	Daylight
059	22.40	04-0626509	Rear End	Dry Clear	02/16/04/ 18:00	Veh_1 Veh_2	South South	Normal Normal	Passenger Pickup		0	0	MON	Darkness, Lighted
059	22.40	04-0626517	~~Turning~~ Rear End	Dry Clear	02/18/04/ 07:00	Veh_1 Veh_2	~~North~~west ~~North~~west	Normal Normal	SUV Passenger	Turning Right Turning Right	0	0	WED	Daylight
059	22.40	04-0626525	Rear End	Dry Clear	02/25/04/ 15:00	Veh_1 Veh_2	West West	Other/Unkno Normal	Passenger Passenger		0	0	WED	Daylight
059	22.40	04-0657462	Turning	Dry Clear	02/04/04/ 15:00	Veh_1 Veh_2	North LTL North	Other/Unkno Other/Unkno	Other Passenger	Backing up in LT Lane Slow/Stop in LT Lane	0	0	WED	Unknown
059	22.40	04-0731135	Angle	Dry Clear	02/11/04/ 09:00	Veh_1 Veh_2	North North	Normal Normal	Passenger SUV	Veh. pulled out of Speedway station on NWC directly into SB LTL, crossing 2 SB thru lanes & got hit.	0	0	WED	Daylight
059	22.40	04-1390659	Angle	Dry Clear	04/04/04/ 18:00	Veh_1 Veh_2	East South	Normal Normal	Pickup Passenger	Veh was SB approaching Batavia Rd., and struck the barrier median & blew out his tire. Then he tried to back UP & hit SB veh. 2.	0	0	SUN	Daylight
059	22.40	04-1390766	Turning	Dry Clear	04/14/04/ 05:00	Veh_1 Veh_2	West North	Normal Normal	Passenger Passenger		0	0	WED	Daylight
059	22.40	04-2621540	Turning	Dry Clear	05/11/04/ 07:00	Veh_1 Veh_2	North Southeast	Normal Normal	Van/Mini-Van Passenger		0	0	TUE	Daylight
059	22.40	04-2621573	Turning	Wet Rain	06/28/04/ 08:00	Veh_1 Veh_2	South North	Normal Normal	Passenger Passenger		0	0	MON	Daylight
059	22.40	04-2623215	Turning	Wet Rain	06/02/04/ 12:00	Veh_1 Veh_2	North South	Normal Normal	Passenger Tractor with		0	1 B	WED	Daylight

GCA-P011 GCA-R01

ILLINOIS DEPARTMENT OF TRANSPORTATION

Date: 2/1/2006

GIS Crash Report Details

(D) IL 59 @ Batavia Rd (2004 Data)

Route	Mile	Case ID #	Collision Type	Surface /Weather	Crash Date Time		Direction	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
059	22.40	04-2652123	Rear End	Dry Clear	06/13/04/ 12:00	Veh_1 Veh_2	East East	Normal Normal	Passenger Passenger		0	2 C	SUN	Daylight
059	22.40	04-3011725	Turning	Dry Clear	07/12/04/ 07:00	Veh_1 Veh_2	South North	Normal Normal	Passenger Pickup		0	2 A	MON	Daylight
059	22.40	04-3743475	Sideswipe Same Dir	Dry Clear	08/01/04/ 22:00	Veh_1 Veh_2	South South	Alcohol Normal	Van/Mini-Van Van/Mini-Van	Does not appear to be LT related	0	1 C	SUN	Darkness, Lighted
059	22.40	04-4756617	Turning	Dry Clear	09/14/04/ 11:00	Veh_1 Veh_2	Northeast North	Other/Unkno Other/Unkno	Passenger Passenger	??? ???	0	0	TUE	Daylight
059	22.40	04-4758894	Rear End	Dry Clear	10/11/04/ 07:00	Veh_1 Veh_2	West West	Normal Normal	Passenger Passenger		0	0	MON	Daylight
059	22.40	04-5290467	Rear End	Wet Rain	11/19/04/ 17:00	Veh_1 Veh_2	North North	Normal Normal	Van/Mini-Van Passenger		0	0	FRI	Darkness, Lighted
059	22.40	04-5502796	Parked Motor Vehic	Ice Clear	12/19/04/ 02:00	Veh_1 Veh_2	West	Other/Unkno	Van/Mini-Van	NOT intersection-related	0	0	SUN	Darkness, Lighted
059	22.40	04-5502879	Rear End	Dry Clear	12/22/04/ 17:00	Veh_1 Veh_2	South South	Normal Normal	Passenger SUV		0	0	WED	Darkness, Lighted

4

5 darkness Lighted, even though there is only one luminaire @ the intersection

Total Injuries: 6 **Total Fatalities:** 0 **Total Crashes:** 20

4 N/S Rear End
4 N/S Left-Turning
1 SB Sideswipe, not necessarially LT related
9 correctable

NOT 2001-2003
HAL

LISA HEAVEN-BAUM
DUPAGE COUNTY--IL 059(MP 02240 - 02240) -- 2003
IL 59 @ BATAVIA ROAD

Obs	COUNTY	ACCDATE	HOUR	RDSURF	LIGHT	COLTYPE	TOT_KILL	TOT_INJ	TOT_SEV1	TOT_SEV2	TOT_SEV3	MILEPOST	CASENUM
1	DUPAGE	012003	06	DRY	DAWN	REAR END	0	0	0	0	0	2240	030085898
2	DUPAGE	012303	07	DRY	DAY	REAR END	0	0	0	0	0	2240	030426902
3	DUPAGE	013103	08	SNOW	DAY	REAR END	0	1	0	0	1	2240	030424956
4	DUPAGE	032103	10	DRY	DAY	TURNING	0	0	0	0	0	2240	031034234
5	DUPAGE	041803	12	DRY	DAY	REAR END	0	0	0	0	0	2240	031630551
6	DUPAGE	062603	09	DRY	DAY	TURNING	0	0	0	0	0	2240	033712217
7	DUPAGE	071903	20	DRY	DAY	PEDALCYCLIST	0	0	0	0	0	2240	033712746
8	DUPAGE	080303	14	DRY	DAY	TURNING	0	0	0	0	0	2240	033713017
9	DUPAGE	100103	08	DRY	DAY	TURNING	0	1	0	0	1	2240	035314293
10	DUPAGE	101503	15	DRY	DAY	TURNING	0	1	0	1	0	2240	035315126
11	DUPAGE	101603	18	DRY	DARK-LT	ANGLE	0	1	0	0	1	2240	035315241
12	DUPAGE	110403	20	WET	DARK-LT	TURNING	0	0	0	0	0	2240	035301878
13	DUPAGE	111803	18	WET	DARK-LT	TURNING	0	0	0	0	0	2240	035309426
14	DUPAGE	111803	19	WET	DARK-LT	TURNING	0	0	0	0	0	2240	035312792
15	DUPAGE	112903	18	DRY	DARK-LT	TURNING	0	0	0	0	0	2240	035314384
16	DUPAGE	121603	09	DRY	DAY	TURNING	0	0	0	0	0	2240	035538248
17	DUPAGE	122703	18	DRY	DARK	PEDESTRIAN	0	1	1	0	0	2240	035538230
18	DUPAGE	122903	17	DRY	DARK-LT	TURNING	0	0	0	0	0	2240	035527894
19	DUPAGE	123003	11	DRY	DAY	REAR END	0	0	0	0	0	2240	035518703
		082503	15	DRY	DAY	LEFT-TURNING	0	1	1	0	0	2240	
							0		2	1	3		

$$EPDO_{01\text{-}03} = \frac{(50 \times 1) + (50 \times 3) + 5(3) + 2(11) + 37}{55}$$

EPDO = 4.982 < critical

CRITICAL EPDO = 6.191

URBAN GROUP 3 - DIVIDED Highway
SIGNALIZED INTERSECTION - 5 AND More

$$EPDO_{01\text{-}04} = \frac{(50 \times 1) + (50 \times 4) + 5(4) + 2(13) + 53}{75}$$

= 4.653 < CRITICAL

01-04

75

#inj & Fatal / total
= 22/75
= 29%

#K = 1
# A = 4
# B = 4
# C = 13
PDO = 53

TOTALS 2001-2003

CRASHES = 55

injury & fatal / TOTAL = 18/55 = 33%

K = 1
A's = 3
B's = 3
C's = 11

PDO = 37 CRASHES

2004

20

4/20

0
1
1
2
16

LISA HEAVEN-BAUM
DUPAGE COUNTY--IL 059(MP 02240 - 02240) -- 2002
IL 59 @ BATAVIA ROAD

Obs	COUNTY	ACCDATE	HOUR	RDSURF	LIGHT	COLTYPE	TOT_KILL	TOT_INJ	TOT_SEV1	TOT_SEV2	TOT_SEV3	MILEPOST	CASENUM
1	DUPAGE	011102	11	DRY	DAY	REAR END	0	0	0	0	0	2240	020387205
2	DUPAGE	011202	14	DRY	DAY	TURNING	0	1	0	0	1	2240	020387239
3	DUPAGE	011202	16	DRY	DAY	ANGLE	0	2	0	0	2	2240	020387619
4	DUPAGE	011802	12	DRY	DAY	TURNING	0	0	0	0	0	2240	020389631
5	DUPAGE	020602	07	DRY	DAY	REAR END	0	0	0	0	0	2240	020639498
6	DUPAGE	022602	12	WET	DAY	REAR END	0	1	0	0	1	2240	020639910
7	DUPAGE	031602	11	DRY	DAY	REAR END	0	0	0	0	0	2240	020873907
8	DUPAGE	042202	01	WET	DARK	FIXED OBJECT	0	0	0	0	0	2240	021457460
9	DUPAGE	060102	17	DRY	DAY	TURNING	0	0	0	0	0	2240	022375828
10	DUPAGE	060502	22	UNK	DARK-LT	REAR END	0	1	0	0	1	2240	022557268
11	DUPAGE	071502	18	DRY	DAY	REAR END	0	0	0	0	0	2240	022727218
12	DUPAGE	072602	16	DRY	DAY	REAR END	0	0	0	0	0	2240	022727580
13	DUPAGE	072602	08	DRY	DAY	ANGLE	1	1	0	1	0	2240	022743215
14	DUPAGE	080102	22	DRY	DARK-LT	REAR END	0	0	0	0	0	2240	023451602
15	DUPAGE	081202	19	DRY	DAY	REAR END	0	0	0	0	0	2240	023424377
16	DUPAGE	092302	17	DRY	DAY	REAR END	0	0	0	0	0	2240	024041485
17	DUPAGE	101002	18	DRY	DAY	TURNING	0	0	0	0	0	2240	024520108
18	DUPAGE	112402	01	DRY	DARK-LT	TURNING	0	1	0	0	1	2240	024790354
19	DUPAGE	121702	20	DRY	DARK	TURNING	0	1	0	0	1	2240	025521980
20	DUPAGE	122402	19	SNOW	DARK-LT	SIDESWIPE SAME DIR	0	0	0	0	0	2240	025171265
21	DUPAGE	122402	19	SNOW	DARK-LT	ANGLE	0	0	0	0	0	2240	025521865
22	DUPAGE	123102	20	Dry	DARK-LT	ANGLE - No INJURY						2240	02·
							1		0	1	6		

LISA HEAVEN-BAUM
DUPAGE COUNTY--IL 059(MP 02240 - 02240) -- 2001
IL 59 @ BATAVIA ROAD

Obs	COUNTY	ACCDATE	HOUR	RDSURF	LIGHT	COLTYPE	TOT_KILL	TOT_INJ	TOT_SEV1	TOT_SEV2	TOT_SEV3	MILEPOST	CASENUM
1	DUPAGE	010501	17	DRY	DARK-LT	REAR END	0	0	0	0	0	2240	010166072
2	DUPAGE	020201	12	DRY	DAY	REAR END	0	0	0	0	0	2240	010872919
3	DUPAGE	033101	11	DRY	DAY	REAR END	0	0	0	0	0	2240	011538337
4	DUPAGE	041401	12	DRY	DAY	PEDALCYCLIST	0	2	0	2	0	2240	011687357
5	DUPAGE	050401	20	DRY	DARK-LT	TURNING	0	0	0	0	0	2240	012069068
6	DUPAGE	052101	12	WET	DAY	TURNING	0	0	0	0	0	2240	012234290
7	DUPAGE	062601	17	DRY	DAY	TURNING	0	0	0	0	0	2240	013296009
8	DUPAGE	070201	06	DRY	DAY	REAR END	0	0	0	0	0	2240	013596481
9	DUPAGE	070501	06	DRY	DAY	REAR END	0	0	0	0	0	2240	013591953
10	DUPAGE	070901	08	DRY	DAY	TURNING	0	1	1	0	0	2240	013592373
11	DUPAGE	080501	11	DRY	DAY	REAR END	0	1	1	0	0	2240	013597000
12	DUPAGE	083001	07	DRY	DAY	REAR END	0	2	0	0	2	2240	013796792
13	DUPAGE	112701	13	WET	DAY	TURNING	0	1	0	0	1	2240	015440605
14	DUPAGE	112901	14	WET	DAY	TURNING	0	0	0	0	0	2240	015448459
15	DUPAGE	122301	05	SNOW	DUSK	REAR END	0	0	0	0	0	2240	015672470
							0		2	1	2		

TOTAL ACCIDENT TABLE

	2000			2001			2002			2003				
Accident Type	#acc.	#inj.	#fat.	#acc.	#inj.	#fat.	#acc.	#inj.	#fat.	#acc.	#inj.	#fat.	Total	%
Vehicle Overturn													0	0.00%
Pedestrian													0	0.00%
Railroad Train													0	0.00%
Cyclist				1	1					1			2	3.08%
Animal													0	0.00%
Fixed Object				1									1	1.54%
Other Object													0	0.00%
Other Noncollision													0	0.00%
Parked Motor Vehicle													0	0.00%
Rear End	4			8	2		10	2		7	1		29	44.62%
Head On	1												1	1.54%
Sideswipe - Same Direction	1						1						2	3.08%
Sideswipe - Opposite Direction													0	0.00%
Angle							2		1	2	1		4	6.15%
Turning	5			6	2		8	4		7	3		26	40.00%
Other													0	0.00%
Total	11			16			21			17			65	
Injuries		0			5			6			5		16	
Fatalities			0			0			1			0	1	

	2000	2001	2002	2003	Total
# Accidents with Injuries		5	6	5	16
# Accidents with Fatalities			1		1
# Accidents on Wet Pavement	2	4	2	2	10
# Accidents on Ice/Snow	1	1	2	1	5

Accident Summary: 2000 to 2003
Location: Safety Project: IL Route 59 @ Batavia Road (Warrenville)

ACCIDENT SUMMARY TABLE

	2000			2001			2002			2003				
Accident Type	#acc.	#inj.	#fat.	#acc.	#inj.	#fat.	#acc.	#inj.	#fat.	#acc.	#inj.	#fat.	Total	%
Cyclist				1	1					1			2	3.08%
Fixed Object				1									1	1.54%
Rear End	**4**			**8**	**2**		**10**	**2**		7	**1**		**29**	**44.62%**
Head On	1												1	1.54%
Sideswipe - Same Direction	1						1						2	3.08%
Angle							2		1	2	1		4	6.15%
Turning	**5**			**6**	**2**		**8**	**4**		7	**3**		**26**	**40.00%**
Total	11			16			21			17			65	
Injuries		0			5			6			5		16	
Fatalities			0			0			1			0	1	

	2000	2001	2002	2003	Total
# Accidents with Injuries		5	6	5	16
# Accidents with Fatalities			1		1
# Accidents on Wet Pavement	2	4	2	2	10
# Accidents on Ice/Snow	1	1	2	1	5

Accident Summary: 2000 to 2003
Location: Safety Project: IL Route 59 @ Batavia Road (Warrenville)

ACCIDENT SUMMARY TABLE

2004 Primary	2004 Secondary	Accident Type 2004	2000 #acc.	2000 #inj.	2000 #fat.	2001 #acc.	2001 #inj.	2001 #fat.	2002 #acc.	2002 #inj.	2002 #fat.	2003 #acc.	2003 #inj.	2003 #fat.	Total	%
		Cyclist				1	1					1			2	3.08%
		Fixed Object				1 -?									1	1.54%
4	4	**Rear End**	**4**			**8**	**2**		**10**	**2**		**7**	**1**		**29**	**44.62%**
		Head On	1												1	1.54%
1	1	Sideswipe - Same Direction	1						1						2	3.08%
		Angle							2		1	2	1		4	6.15%
4	3	**Turning**	**5**			**6**	**2**		**8**	**4**		**7**	**3**		**26**	**40.00%**
9	8	Total	11			~~16~~ 15			21			17			65	
3	1	Injuries		0			5			6			5		16	
0	ø(1)	Fatalities			0			0			1			0	1	

	2000	2001	2002	2003	Total
# Accidents with Injuries		5	6	5	16
# Accidents with Fatalities			1		1
# Accidents on Wet Pavement	2	4	2	2	10
# Accidents on Ice/Snow	1	1	2	1	5

Accident Summary: 2000 to 2003
Location: Safety Project: IL Route 59 @ Batavia Road (Warrenville)

IL 59 & Batavia RD
City: **Warrenville**
County: **DuPage**
District: **1**

Summary
State Of Illinois
Department of Transportation
Bureau of Traffic
Summary of Traffic Survey

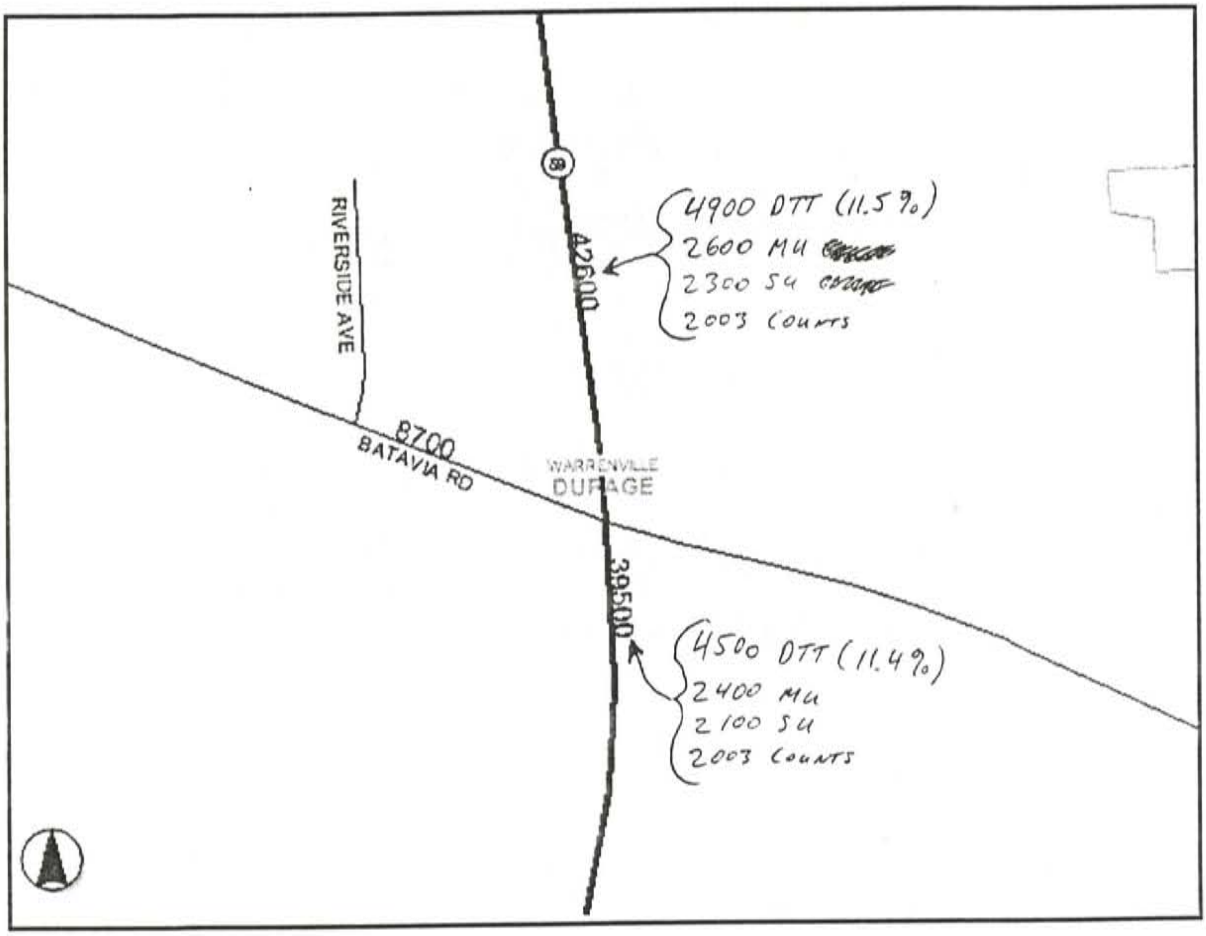
Dates: 04/02/2004 **(AM)**
03/31/2004 **(PM)**

Route	Traffic From: N **IL 59** Going				Traffic From: S **IL 59** Going				**TOTAL NORTH SOUTH**	Traffic From: E **Batavia RD** Going				Traffic From: W **Batavia RD** Going				**TOTAL EAST WEST**	**GRAND TOTAL**
Start Hour	**E**	**S**	**W**	**TOTAL**	**W**	**N**	**E**	**TOTAL**		**S**	**W**	**N**	**TOTAL**	**N**	**E**	**S**	**TOTAL**		
6:00	110	926	22	1,058	47	1,234	60	1,341	**2,399**	48	61	92	201	77	79	39	195	**396**	**2,795**
7:00	196	1,250	34	1,480	74	1,509	95	1,678	**3,158**	86	114	176	376	92	129	57	278	**654**	**3,812**
8:00	195	1,124	36	1,355	112	1,135	78	1,325	**2,680**	87	132	120	339	61	123	55	239	**578**	**3,258**
9:00	105	967	46	1,118	88	996	82	1,166	**2,284**	114	139	108	361	75	120	51	246	**607**	**2,891**
10:00	142	773	18	933	45	877	88	1,010	**1,943**	108	103	95	306	58	110	52	220	**526**	**2,469**
11:00	142	1,013	37	1,192	46	1,118	125	1,289	**2,481**	166	146	139	451	83	127	78	288	**739**	**3,220**
12:00	124	884	53	1,061	77	869	118	1,064	**2,125**	182	143	106	431	79	121	71	271	**702**	**2,827**
13:00	105	978	36	1,119	74	923	98	1,095	**2,214**	141	132	126	399	83	107	88	278	**677**	**2,891**
14:00	100	964	34	1,098	50	1,031	75	1,156	**2,254**	136	108	137	381	59	74	69	202	**583**	**2,837**
15:00	154	1,372	35	1,561	60	1,289	119	1,468	**3,029**	182	135	150	467	137	150	109	396	**863**	**3,892**
16:00	194	1,580	53	1,827	89	1,408	151	1,648	**3,475**	197	189	234	620	132	221	166	519	**1,139**	**4,614**
17:00	206	1,568	65	1,839	90	1,345	135	1,570	**3,409**	239	193	268	700	191	295	121	607	**1,307**	**4,716**

Traffic Report 4 leg Version 2.5

Illinois Department of Transportation

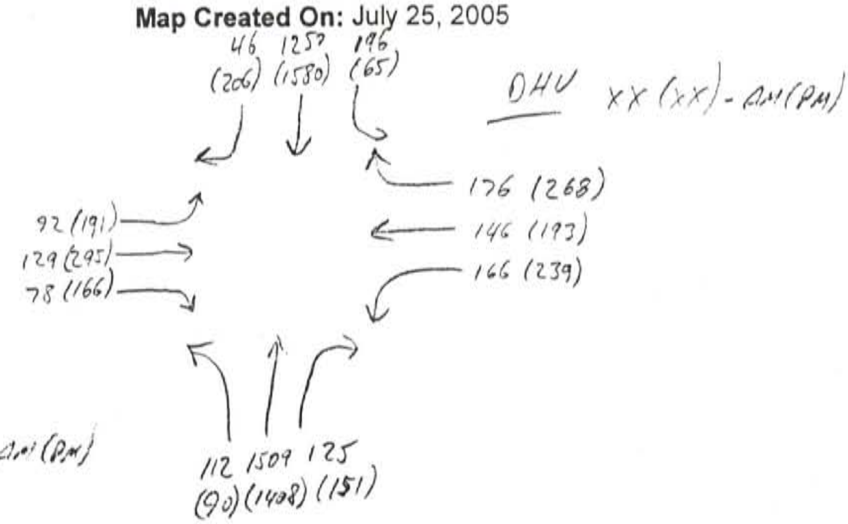
Annual Average Daily Traffic

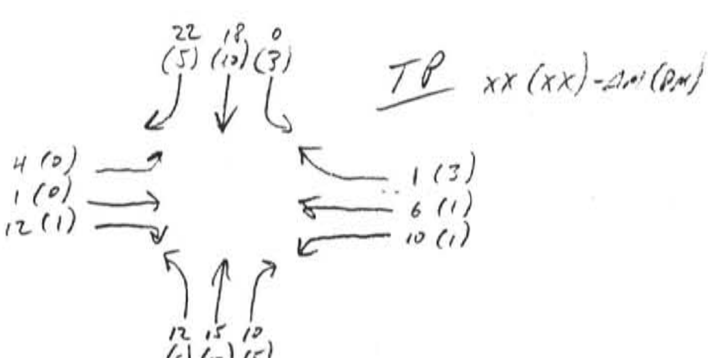


Annual Average Daily Traffic

Map Created On: July 25, 2005

Selected Features
Marked Routes
US Routes
Illinois Routes
Interstates
1200 AADT Counts
Cities
County Boundaries
IDOT Districts





Illinois Department of Transpo

Division of Highways/District 1
201 West Center Court/Schaumburg, Illinois 60196-1096

IDOT Division Of Highways District One	Init.	*
Dist. Engineer		
Asst. To The D.E.		
ENG. Proj. Imp.		
Construction		
Local Roads		
Materials		
EEO		
ENG. Prog. Dev.		
Design		
Land Acq.		
Programming		I
Public Info.		
ENG. Oper.		
Elect. Oper.		
Maintenance		
→ Traffic		
Administration		
To:		
To:		
Asst. Deputy Sec.		
Qlty. Compliance		
Region 1 Claims		
* I = Information A = Action		

RT1 (D) Illinois Route 59 @ Batavia Road

August 25, 2004

Mr. John Naydenoff
Deputy Chief
City of Warrenville
3S245 Warren Avenue
Warrenville, IL 60555

Dear Deputy Naydenoff:

This is a follow-up to our interim letter of February 20, 2004 with regard to the intersection of Illinois Route 59 and Batavia Road in the City of Warrenville. Our traffic engineering study of this signalized intersection is complete.

cc Lisa

Using crash data provided by our Division of Traffic Safety as well as "Illinois Traffic Crash Reports" provided by the Warrenville Police Department, our staff reviewed the crash history at this intersection from the year 2000 to present. The increase in left-turning accidents along Illinois 59 in 2003 and 2004 supports the installation of "Left-Turn on Green Arrow Only" (LTOAO) phasing for the Illinois 59 approaches.

However, LTOAO phasing cannot be implemented until geometric revisions are made to the northbound and southbound left-turn lanes along Illinois 59 at Batavia Road. The northbound and southbound left-turn lanes will need to be lengthened to provide additional storage to contain the increased queue projected with LTOAO phasing. This will require removal of the existing corrugated median and pavement replacement to provide the additional left-turn storage. Additional improvements to the traffic signal equipment will also be required in conjunction with geometric improvements to Illinois 59.

The Department's 2005-2011 Multi-year Highway Program (2005-2011 MYP) does not include funding for geometric and traffic signal improvements to this intersection. The Program, however, is reviewed on an annual basis and this project will be considered for inclusion in future highway improvement programs.

If you have any questions or need additional information, please contact Lisa Heaven-Baum, Traffic Studies Engineer, at (847) 705-4135.

Very truly yours,

Diane M. O'Keefe, P.E.
District Engineer

By:
David A. Ziesemer, P.E.
Bureau Chief of Traffic

bcc: Mike Matkovic
Lisa Heaven-Baum
Steve Travia
Ray Racoma

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fet 7/29/04

POLICE
City of Warrenville
DEPARTMENT

3 S 245 Warren Avenue • Warrenville, IL 60555 630/393-2131

Robert W. LaDeur Chief of Police FAX 630/393-4071

July 23, 2004

Illinois Department of Transportation
Division I Highways/District 1
201 West Center Court
Schaumburg, IL 60196-1096
Attn: Mr. David A. Ziesemer

Dear Sir,

Re: Route 59 at Batavia Road

This letter is meant as a follow-up to our earlier correspondence in February 2004 as it pertains to the intersection of Illinois Route 59 and Batavia Road in the City of Warrenville. Your letter dated February 20, 2004 made reference to a manual traffic count and an accident history review to determine if there is a pattern of left turning accidents which could be addressed by restricting left turn movements on the green arrow only.

I spoke with Lisa Heaven-Baum who was very helpful and was aware of this situation. She indicated that she would get back to me with information as soon as possible.

The purpose of this letter is to provide you with copies of accident reports in which the proximate cause was a vehicle turning left either on the yellow or after the red. Of the nine drivers involved in the four crashes, three of them sustained injuries.

Thank you in advance for your efforts in this matter. I remain . . .

Respectfully,

Robert W. LaDeur
Chief of Police

RLaD/ge
attach.

Illinois Department of Transportation

Division of Highways/District 1
201 West Center Court/Schaumburg, Illinois 60196-1096

STATE OF ILLINOIS DEPT. OF TRANS. BUREAU OF TRAFFIC RECEIVED		
ROUTE	NOTE	ACT
TRAFFIC ENGR.		
PROGRAMS	Leh	
OPERATIONS		
PERMITS		
SERVICES		
FILE		

RT1 (D) Illinois Route 59 @ Batavia Road

February 20, 2004

Mr. John Naydenoff
Deputy Chief
City of Warrenville
3S245 Warren Avenue
Warrenville, IL 60555

Dear Deputy Naydenoff:

This is in response to your letter of February 9, 2004 with regard to the intersection of Illinois Route 59 and Batavia Road in the City of Warrenville.

Before any revision to traffic signal phasing can occur at a State controlled intersection, the change must first be warranted by a traffic engineering study. An essential part of this study is a review of the existing traffic volumes at the signalized intersection. We have scheduled a manual traffic count to be taken in the near future.

Our staff will also review the accident history of this intersection to determine if there is a pattern of left-turning accidents which could be addressed by restricting left-turn movements to the green arrow indication only.

We will let you know the results of these investigations as soon as they are completed.

If you have any questions regarding this matter, please contact Lisa Heaven-Baum, Traffic Studies Engineer, at (847) 705-4135.

Very truly yours,

John P. Kos, P.E.
District Engineer

By: David A. Ziesemer
David A. Ziesemer, P.E.
Bureau Chief of Traffic

LH/vcf

bcc: Andy Schuetze
Reading File

S:\Gen\WP\Studies\bataviNayd.doc

POLICE
City of Warrenville
DEPARTMENT

3 S 245 Warren Avenue • Warrenville, IL 60555 630/393-2131

Robert W. LaDeur Chief of Police FAX 630/393-4071

February 9, 2004

SMT 2/17/04

2/18/04 NOT HAL. (2002)

Illinois Department of Transportation
Stephen Travia
201 W Center Ct
Schaumburg, Illinois 60196

Dear Stephen Travia

I would like to arrange a time to discuss some of the accidents that we experience at the intersection of Rout 59 and Batavia Road in Warrenville, Illinois. It appears that we are experiencing a disproportionate amount of vehicle accidents at this intersection and we believe that the common cause may be lead by the design of the left turn lanes and the lack of left turn on arrow only signals. I have enclosed copies of the traffic crashes that have occurred for the last couple of years at this intersection. Any analysis and consideration given into this intersection would be appreciated. I look forward to discussing this with you in the future. Thank you for your time in this matter.

Respectfully;

Deputy Chief John Naydenoff
Warrenville Police Department

Lisa,

I left the Deputy Chief a voice mail message saying we got his letter & would follow up shortly with either an interim or final response.

SMT

Number	Date	Time	# of Vehicles	Injured Persons
1	1/8/2002	12:10 PM	2	0
2	1/12/2002	2:13 PM	2	1
3	1/12/2002	4:50 PM	2	2
4	4/22/2002	1:26 PM	1	0
5	6/1/2002	5:25 PM	2	0
6	6/3/2002	11:25 AM	2	0
7	10/10/2002	6:00 PM	2	0
8	10/14/2002	8:09 PM	2	0
9	10/30/2002	2:45 PM	2	0
10	11/24/2002	1:10 AM	2	0
11	12/12/2002	8:59 PM	3	1
12	12/24/2002	7:30 PM	2	0
13	12/31/2002	8:44 AM	2	1
14	1/31/2003	8:44 AM	2	1
15	7/26/2003	9:00 AM	2	0
16	7/18/2003	7:25 AM	2	0
17	7/19/2003	8:04 PM	2	0
18	8/3/2003	2:11 PM	2	0
19	8/25/2003	3:59 PM	2	1
20	10/1/2003	8:17 AM	2	1
21	10/15/2003	3:54PM	2	0
22	10/16/2003	6:56 PM	2	1
23	11/18/2003	6:54 PM	2	0
24	11/18/2003	7:41 PM	2	0
25	11/29/2003	6:33 PM	2	0
26	12/27/2003	6:52 PM	2	1
27	12/29/2003	5:04 PM	2	0

Illinois Department of Transpor

Memorandum

IDOT Division Of Highways District One	Init.	*
Dist. Engineer		
Asst. To The D.E.		
ENG. Proj. Imp.		
Construction		
Local Roads		
Materials		
EEO		
ENG. Prog. Dev.		
Design		
Land Acq.		
Programming		I
Public Info.		
ENG. Oper.		
Elect. Oper.		
Maintenance		
→ Traffic		A
Administration		
To:		
To:		
Asst. Deputy Sec.		
Qlty. Compliance		
Region 1 Claims		
* I = Information A = Action		

To: Michael Matkovic

From: David Ziesemer

Subject: (D) Illinois 59 @ Batavia Road

Date: September 9, 2004

The Bureau of Traffic has recently reviewed the following ~~x~~ intersection and proposes the following improvements:

Illinois 59 @ Batavia Road:
Removal of the existing corrugated median and pavement replacement to provide additional left-turn lane storage for the north and south approaches on Illinois 59. Also, traffic signal modernization to provide protected Left-Turn-On-Arrow-Only phasing.

This intersection is not identified as a high accident location; however, an increase in the number of left-turning crashes supports the need for protected only left turn phasing. The Bureau of Traffic is interested in pursuing these proposed intersection improvements as a potential discretionary project to be considered in a future Safety Program. Please provide a detailed cost estimate for the proposed improvement in order to determine eligibility for participation in a future Safety Program. Attached are photos, collision diagrams, and location map for your assistance.

bcc: L. Heaven-Baum
S. Bauer

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Illinois Department of Transportation

Memorandum

To: Terry Rammacher

From: Michael J. Matkovic

Subject: Safety Project: Illinois Route 59 at Batavia Road
City of Warrenville, DuPage County

Date: September 8, 2005

The Geometrics Unit has completed its analysis of the High Accident Location of Illinois Route 59 at Batavia Road, located in the City of Warrenville, DuPage County. Please refer to the attached location map for orientation. The above location was identified as a 2001-2003 High Accident Location (HAL). The intersection is being considered for a safety improvement. Please note the following findings.

Investigation & Analysis

Illinois Route 59 is a Strategic Regional Arterial maintained by IDOT whereas Batavia Road is a Minor Arterial maintained by the City of Warrenville. Contract plan documents, a condition diagram prepared by the Bureau of Traffic and pictures taken at the location show the existing conditions for the intersection. Currently, Illinois Route 59 has a 5-lane cross-section with 12-ft through lanes and an 18-ft median. As the route approaches the intersection, a 12-ft left-turn lane neighbored by a 6-ft barrier median can be found. North and south of the intersection the median is flush with the pavement and is either a two-way left-turn lane or a pavement marked median. Between the flush and barrier medians there is a small amount of corrugated median. Currently, Batavia Road provides one left-turn lane, one through lane and one right-turn lane at each approach to the intersection. Away from the intersection Batavia Road tapers to a 2-lane cross-section. On-street parking is not permitted, and no bus stops were located within the vicinity of the intersection. The investigation revealed the following items:

- The predominant accident type is "Rear End" (45%). Capacity is a major contributor to these types of accidents. However the addition of through lanes on Illinois Route 59 is beyond the scope of this spot improvement.
- "Turning" is the second most common accident type at 40%. The south leg of Illinois Route 59 is on a vertical and horizontal curve. This causes poor sight distance for the southbound left-turn movement on Illinois Route 59, which is the largest contributor to this accident type. Left-turn on arrow only would reduce the potential for turning accidents.
- Wet pavement or ice/snow conditions were not considered to be a major factor in the accidents with only 15 of the 65 (23%) accidents reported between 2001 and 2003 having either of these conditions.

Recommended Countermeasures

The recommended improvement proposed by the Geometrics Unit, which is supported by the Traffic Signals Studies Unit (TSSU) of the Bureau of Traffic, would restrict left-turn movements on Illinois Route 59 to "left on arrow only". Traffic counts were provided by the TSSU and capacity analyses were performed by the Geometrics Unit. The proposed improvement would require additional storage for the left-turn lanes on Illinois Route 59. The additional storage would be provided by the removal of the existing corrugated medians on both the north and south legs of the intersection. Barrier curb & gutter would be placed next to the additional left-turn storage. This addition of barrier curb & gutter would not result in the restriction of any existing full access driveways on Illinois Route 59. Additional storage for left-turning vehicles can be accommodated by both the striped medians and the two-way left-turn lanes located at the beginning of both left-turn lanes on Illinois Route 59, effectively removing left-turn traffic from the through lanes. The introduction of dual left-turn lanes on Illinois Route 59 was considered for this improvement but was not deemed as a practical solution.

Cost Estimate

Based on cost effectiveness and intersection capacity, the Geometrics Unit recommends restricting left-turn movements on Illinois Route 59 to "left on arrow only" and the removal of corrugated medians to increase storage in the subject left-turn lanes. The estimated cost for the proposed improvement is approximately $96,500. This cost estimate does not include the cost of any traffic signal work.

If you have any questions or need additional information, please contact Adam Lintner at (847) 705-4085 or Jason Salley at (847) 705-4017.

cc: Roger Valente
Jason Salley

SPEED LETTER®

FROM
[illegible] ESTIMATING UNIT
JOHN FORTMANN x 4385

TO
PROGRAMMING/GEOMETRICS UNIT
JASON SALLEY x4017

SUBJECT SAFETY PROJECT: IL 59 @ BATAVIA ROAD (WARRENVILLE, DUPAGE COUNTY)

MESSAGE

JOHN,

I PREVIOUSLY SUBMITTED TO YOU & YOUR UNIT A REQUEST FOR ESTIMATION FOR THE ABOVE-MENTIONED SAFETY PROJECT. I HAVE ENCLOSED REVISIONS TO THIS SAFETY PROJECT.

DATE 8/15/05 SIGNED [signature]

REPLY

THE COST ESTIMATE FOR THE SUBJECT IS $96,500.

THIS COST ESTIMATES INCLUDES, MOBILIZATION, TCP AND 20 % CONTINGENCY.

DATE 8/23/05 SIGNED CHANDRA THAKKAR
EM

WilsonJones®

RECIPIENT: RETAIN WHITE COPY, RETURN PINK COPY.
PLEASE TURN OVER FOR USE WITH WINDOW ENVELOPE.

44-912 • Triplicate
Carbonless Snap-A-Way® Forms

10 to 15 days

Quantities for Illinois Route 59 @ Batavia Road

Pay Item #	Pay Item	Quantity
	Bit. Conc. Surf. Crse., Superpave, Mix "D" N70	60 Tons
44000008	Bituminous Surface Removal, 2 1/2"	1,435 Square Yards
X4067100	Polymerized Leveling Binder (Machine Method), Superpave, IL-4.75, N50 3/4"	90 Tons
40600980	Bituminous Surface Removal - Butt Joint	313 Square Yards
	Pavement Marking - Stop Bar (24")	90 Linear Feet
	Pavement Marking - Solid Yellow (4")	2,004 Linear Feet
	Pavement Marking - Skip Dash (4")	40 Linear Feet
	Pavement Marking - Solid White (4")	1,228 Linear Feet
X6060500	Corrugated Concrete Removal	6,617 Square Feet
	Barrier ~~Curb~~ MEDIAN Addition	478 Square Feet
	Remove Concrete Curb & Gutter	219 Linear Feet
	~~Replace~~ PDCP Concrete Curb & Gutter 6-24	206 Linear Feet
	TRAFFIC CONTROL	1. L-SUM

APPENDIX G
HSIP CANDIDATE FORM

ID: 999999		
District: 1	***County:*** Cook	***City:*** Willow Springs
Key route:	***Marked route:***	
Route: Willow Springs Rd./ Flavin Rd.	***Intersecting Roadway:*** South of IL 171 to 95th Street	☒ N/A
Length: 1.1 ☐ N/A		***Milestation:*** 1.50 to 2.60

Location Description: The existing roadway cross-section Willow Springs Rd. from south of IL 171 to 95th St. is a winding 2-lane roadway with no shoulders. Guardrail exists at some parts of the roadway curvature. The land use on both sides of Willow Springs Rd./Flavin Rd. throughout this segment is forest preserve.

☐ ***Rural*** ☒ ***Urban***	***Lanes:*** 2
AADT: 10,500	***Speed Limit:*** 40 mph
Friction Test Results: ☒ N/A	***Lighting:*** ☐ Y ☒ N

CHSP Emphasis Area(s): Roadway Departure ☒ District Knowledge ☐ Systematic Improvements ☐ N/A

HALIS Peer Group: 1-Urban Two way Street-Segment ☐ N/A

Critical Values Exceeded: ☐ Freq ☐ Rate ☐ EPDO

Other:

		Crashes Details										
Year	**Total Crashes**	**Fatal Crashes**	**Fatalities**	**A-Injury crashes**	**A-Injuries**	**B-Injury Crashes**	**B-Injuries**	**C-Injury Crashes**	**C-Injuries**	**PDO**	**Wet-Weather**	**Darkness (not lighted)**
2001	33	0	0	1	3	3	3	5	5	24	24	6
2002	47	0	0	0	0	18	7	4	3	25	34	17
2003	50	1	1	4	4	6	4	3	4	36	43	14
2004	No data available											
2005	No data available											
Total	130	1	1	5	7	27	14	12	12	85	101(77%)	37(29%)

Problem Description: The predominant crashes are fixed object and vehicle overturned crashes, which relates to run-off the roadway, especially on wet pavement.

Previous Safety Improvements: None known

Collision Diagram: ☒ Y ☐ N	***Images:*** ☒ Y ☐ N

Predominant Crash Types: Fixed object (56%) and vehicle overturned (11.5%)

Proposed Improvement(s): Skidproof the pavement, install guardrail in the entire section of the roadway curvature, install raised reflective markers on both the centerline and edges of pavement, tree clearing/trimming, and investigate existing roadway cross slopes on the curves to evaluate if current superelevation requirements are met.

Estimated Project Cost: $400,000	***Benefit-Cost Ratio:*** 5.56
Local Projects: Annual Fatality rate/100 Miles:	Annual Crash A Injury Rate/100 Miles:
Local Roads Rural Functional Class:	
Approved:	***Central HSIP Approval Date:***
Signed: ***State Safety Engineer***	***Funding:***
Comment:	

Distribution: ☐ OPP ☐ District ☐ BSE ☐ LRS ☐ BDE

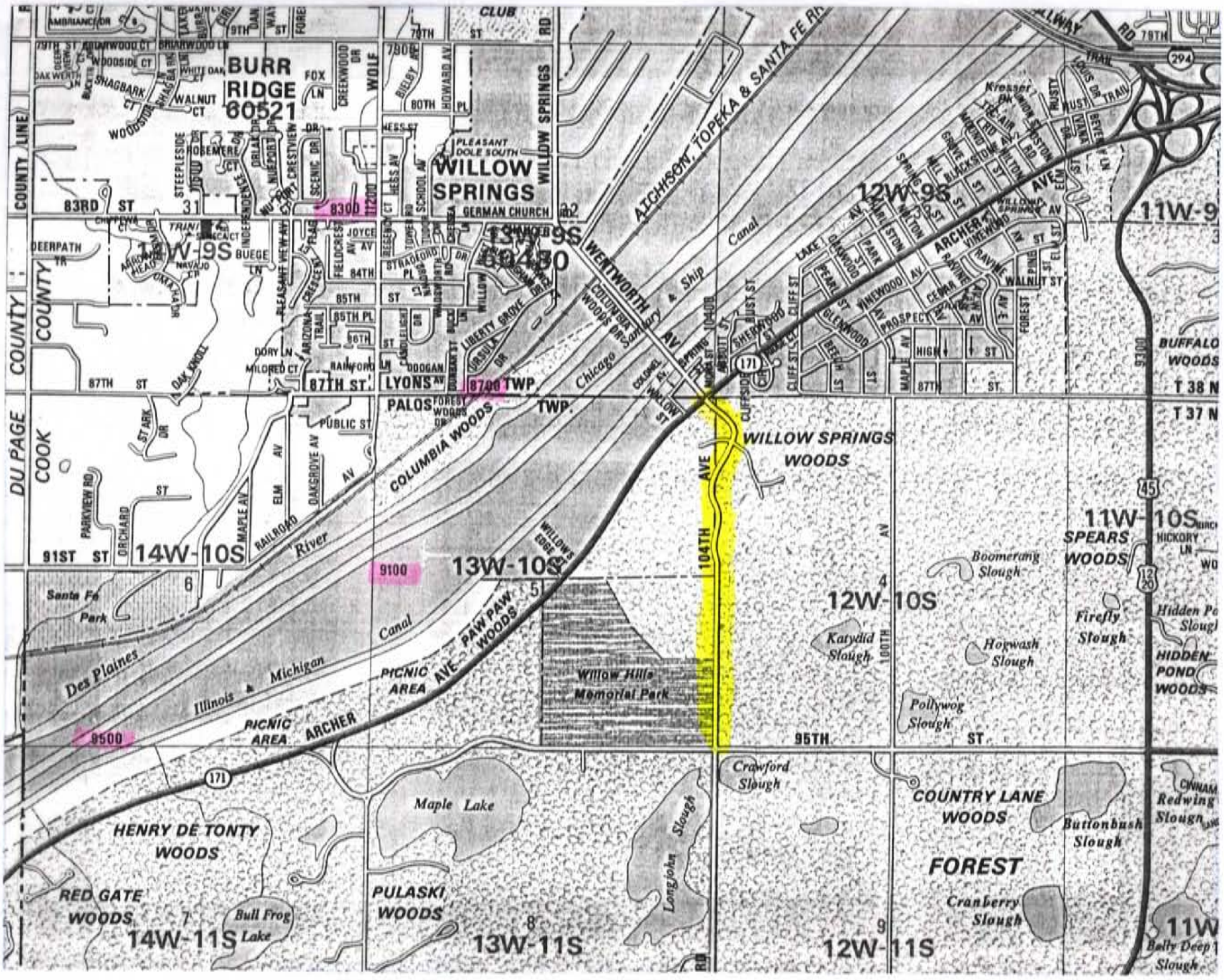
SAMPLE

BENEFIT-COST ANALYSIS

				Countermeasure 1		
Project No.	999999				Date	9/7/2006
Location	Willow Springs Rd.	Flavin Rd	to	IL171	Prepared by	
Length (miles)	1.1				Current ADT	10500
Type	Roadway segment					
Crash data:	From	2001	to	2003	Total yrs	3
Total crashes:	130					
Safety improvement being considered:	BD-Skidproofing					
Estimated cost	400	(Thousand)				
Estimated service life	5	years				
Estimated overall crash/severity reduction factor	25	percent				
Crash type affected by safety improvement:	All crashes					
Number of crashes of this type along this corridor:	130					
Fatal crashes	1	# fatals	1	x	$3,760,000	$3,760,000
Injury crashes	44	# major injuries	7	x	$188,000	$1,316,000
	0	# minor injuries	14	x		$0
	0	# possible injuries	12	x		$0
PDO crashes	85			x		$0
Total crashes affected by this safety improvement:	130				Total loss	$5,076,000
Cost per crash	$39,046					
Crash rate	1027.89	Crashes per HMVM				
B/C analysis						
Estimated traffic volume	0.22	HMVM				
Total crash loss without improvement	$8,900,262					
Total crash benefit	$2,225,065					
B/C ratio	5.56					
	Crashes reduced					
Fatals	0.42	18.33	Major Injuries			
	Crashes remaining					
Fatals	0.58	25.67	Major Injuries			

SAMPLE

This spreadsheet is used for B/C Analysis of roadway segments. The numbers used are an example for the analysis process.



Location Map

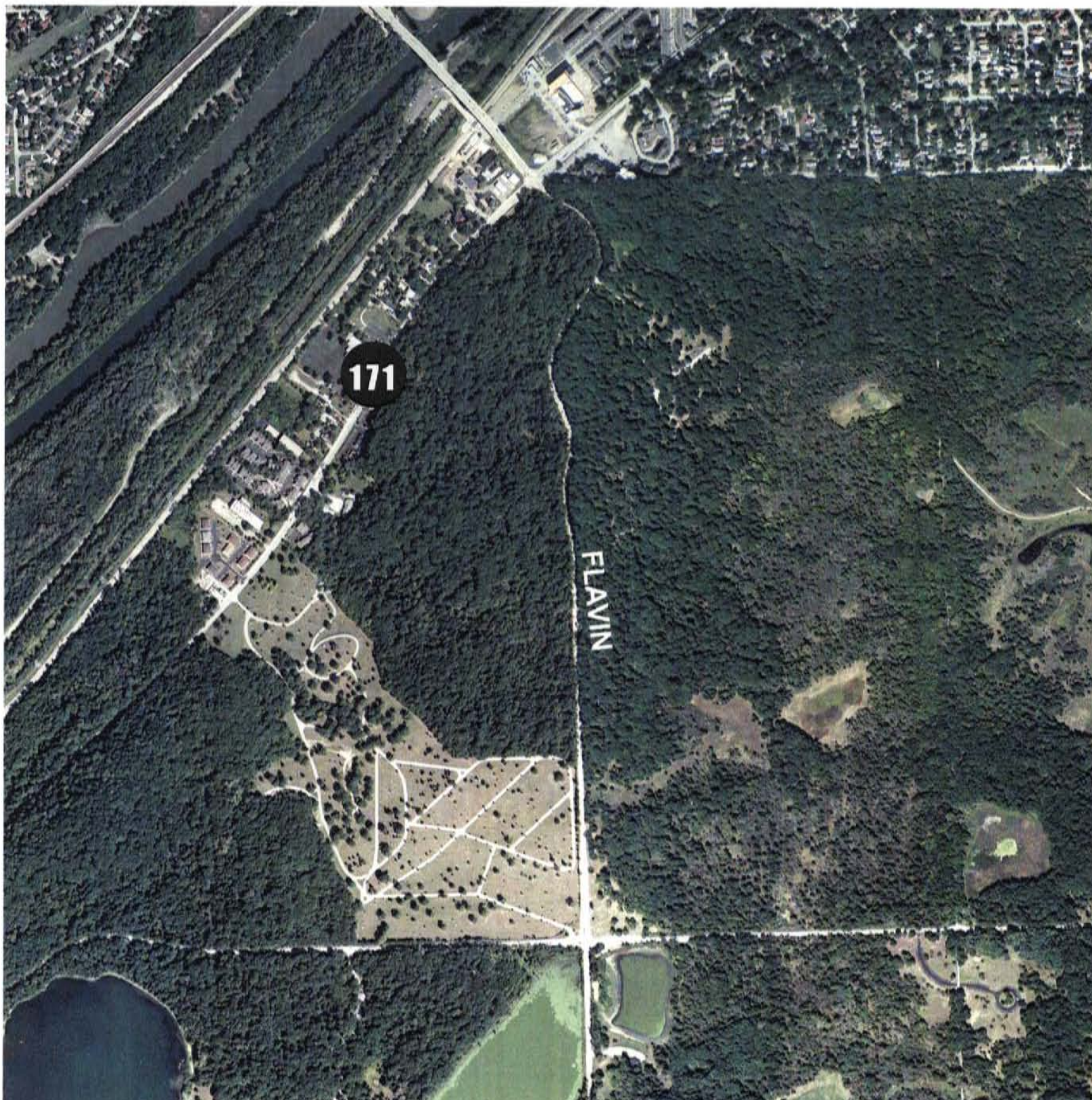
Proposed Improvement:

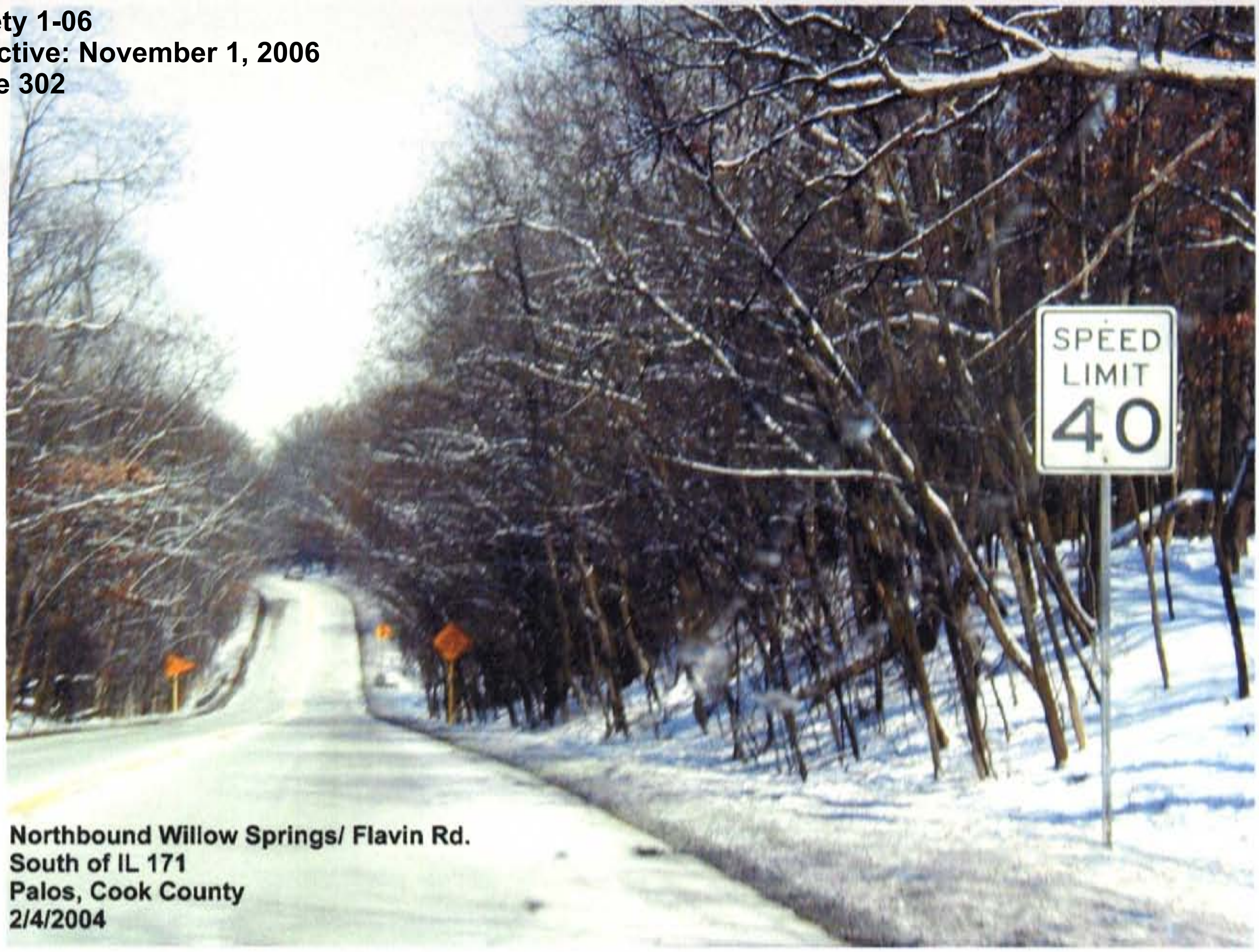
Willow Springs Road; South of IL. 171 to 95th St.

Municipality: Village of Willow Springs

County: Cook

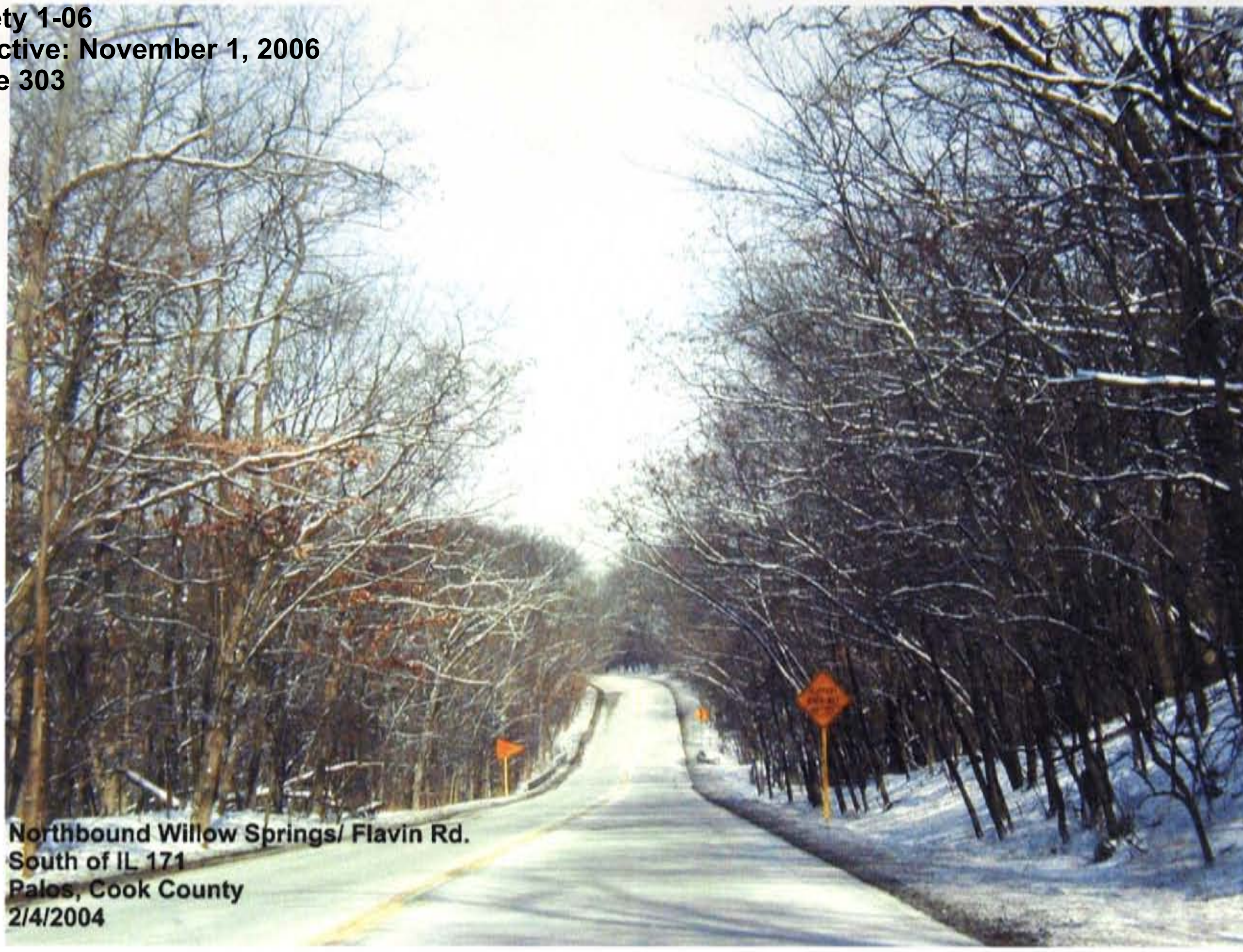
Willow Springs Road (Flavin Rd) south of IL 171





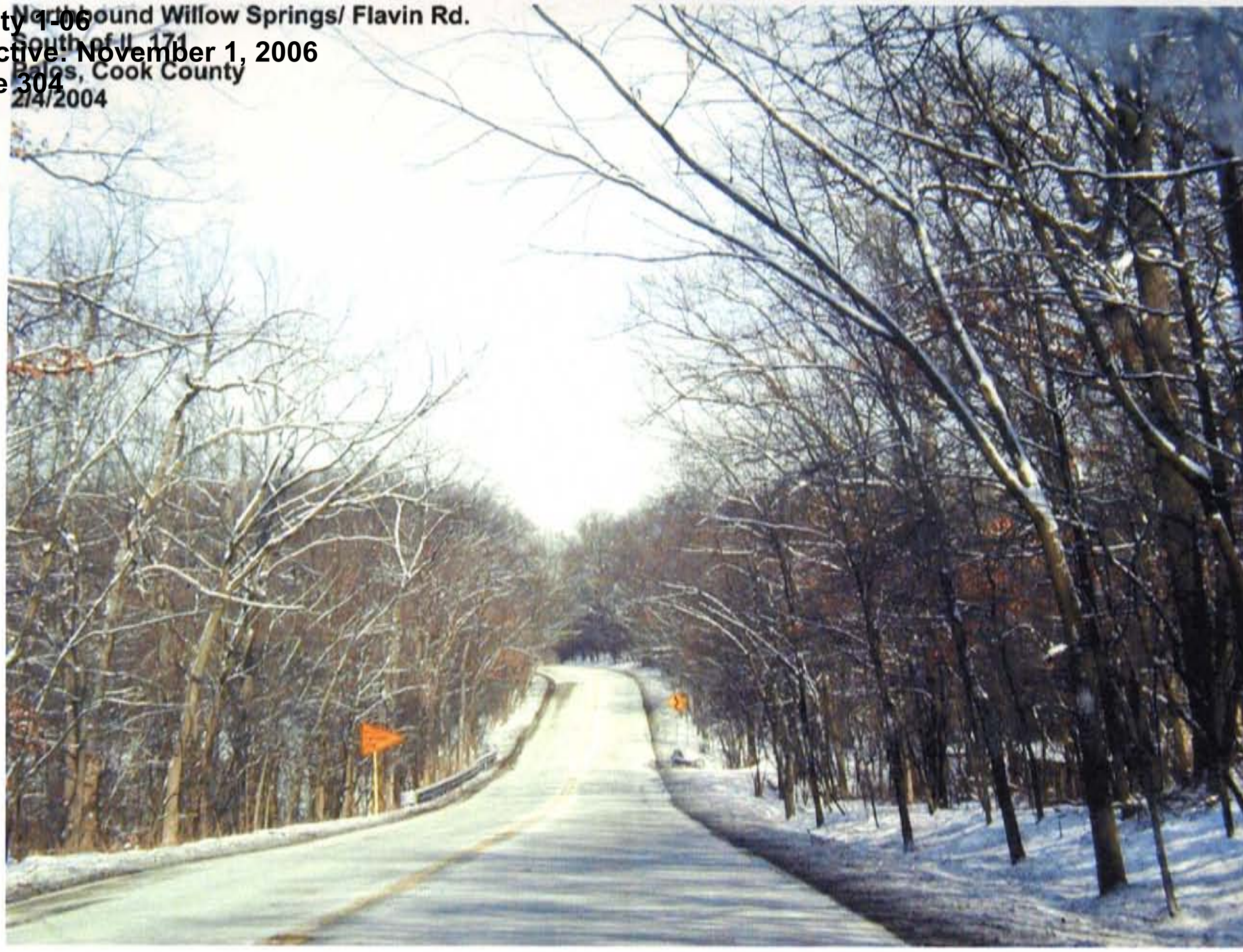
Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004



Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

NORTH Southbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004


ound Willow Springs/ Flavin Rd.
Cook County


Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

Northbound Willow Springs/ Flavin Rd.
South of IL 171
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2/4/2004

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South of IL 171
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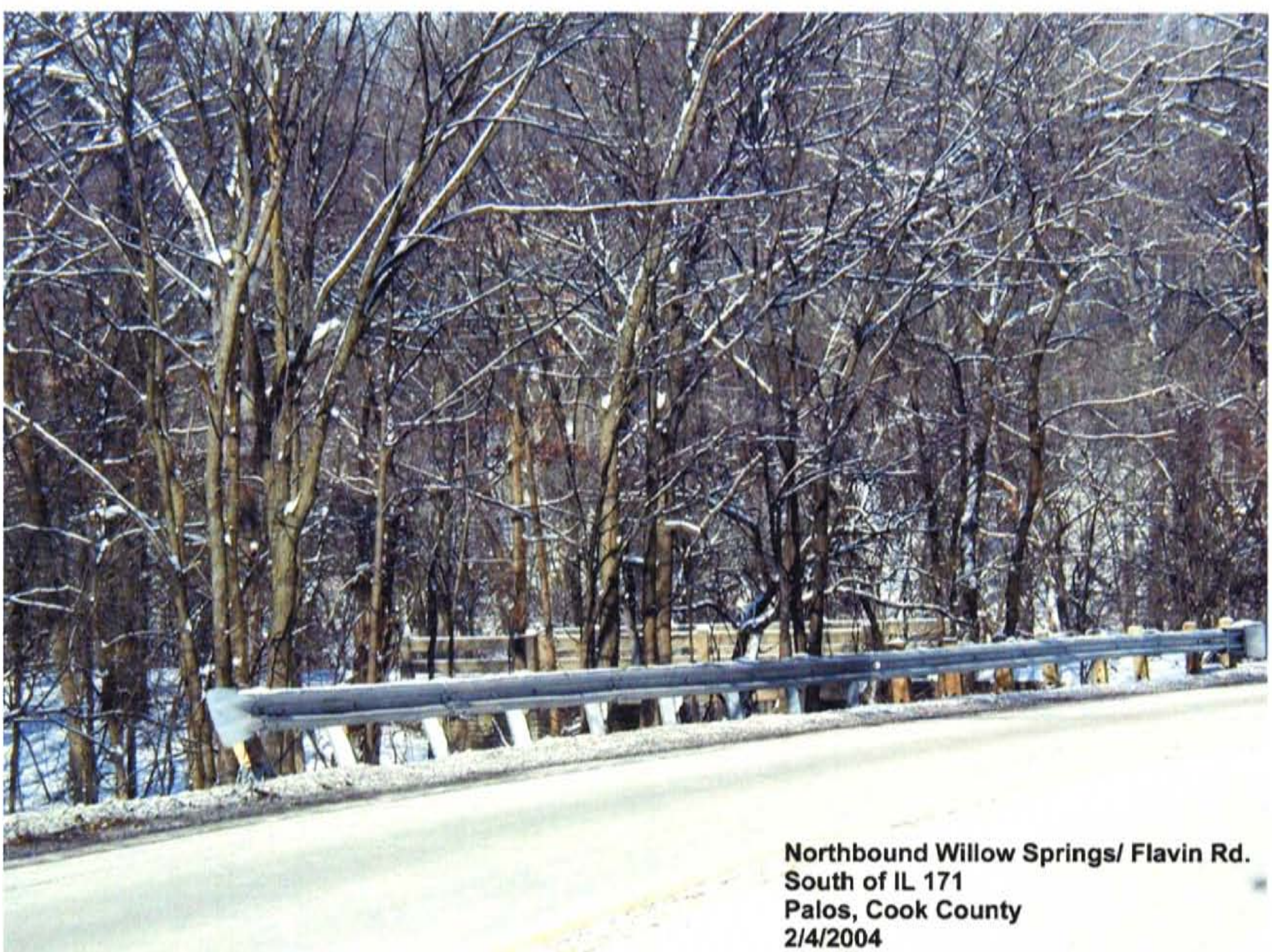
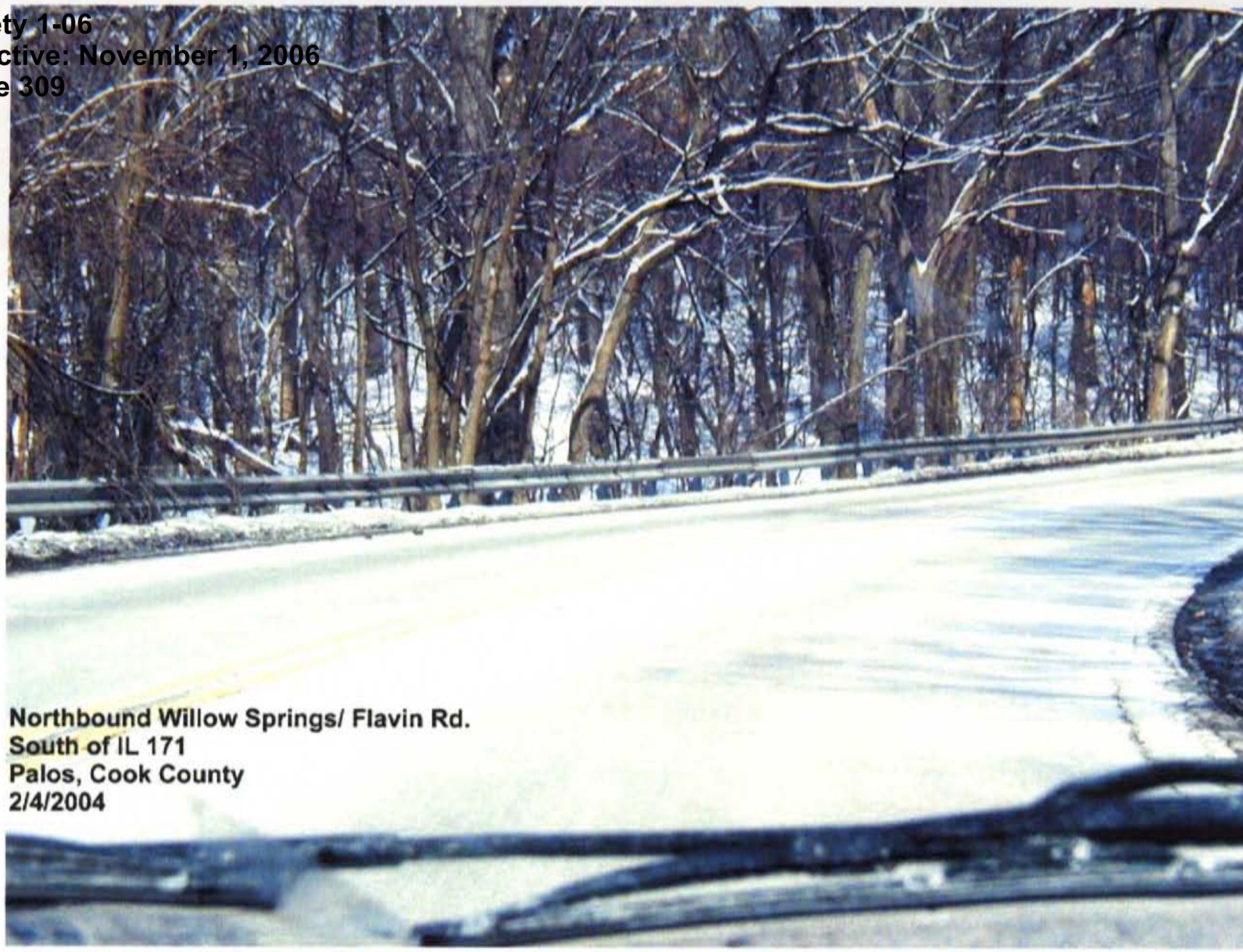
Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

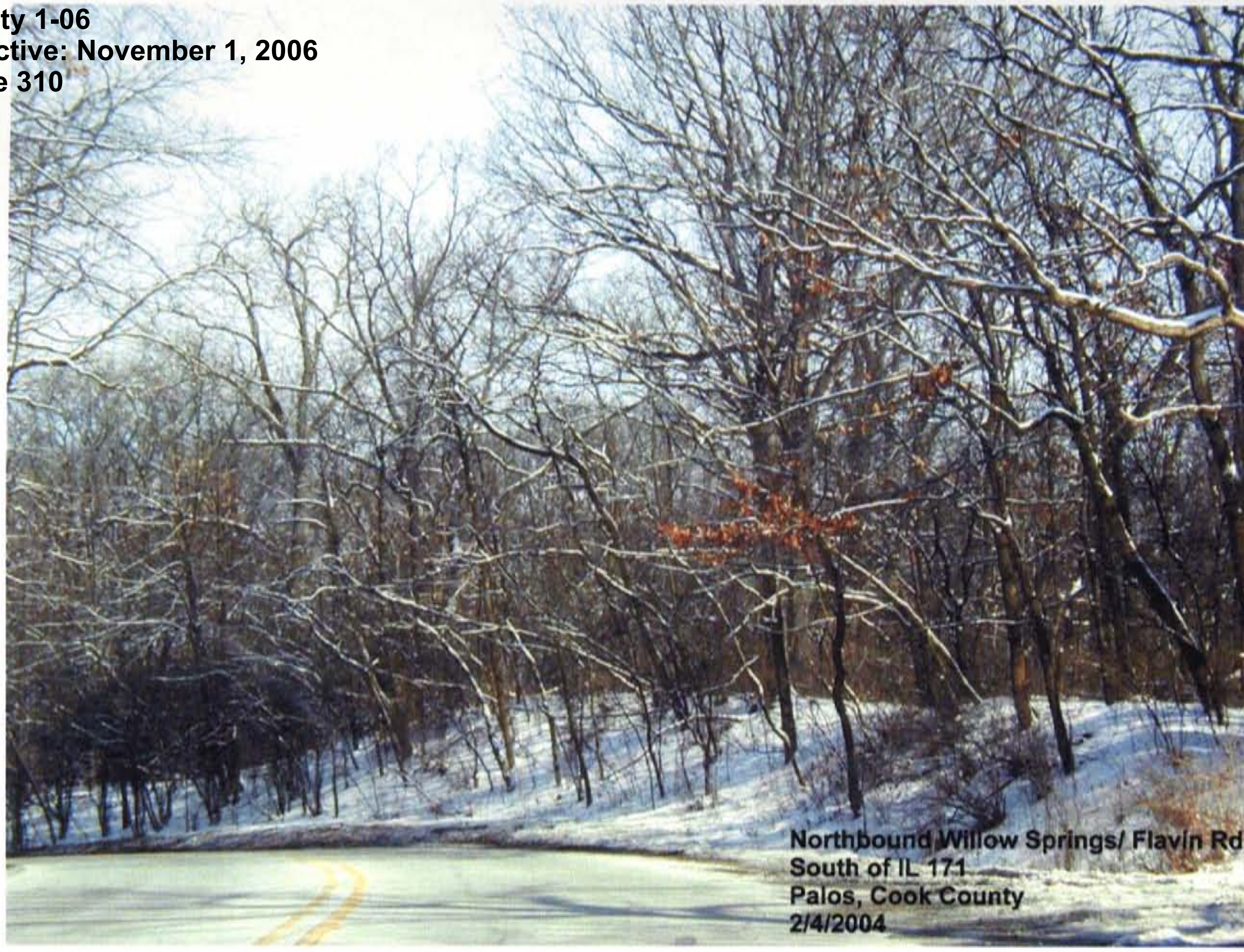


Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

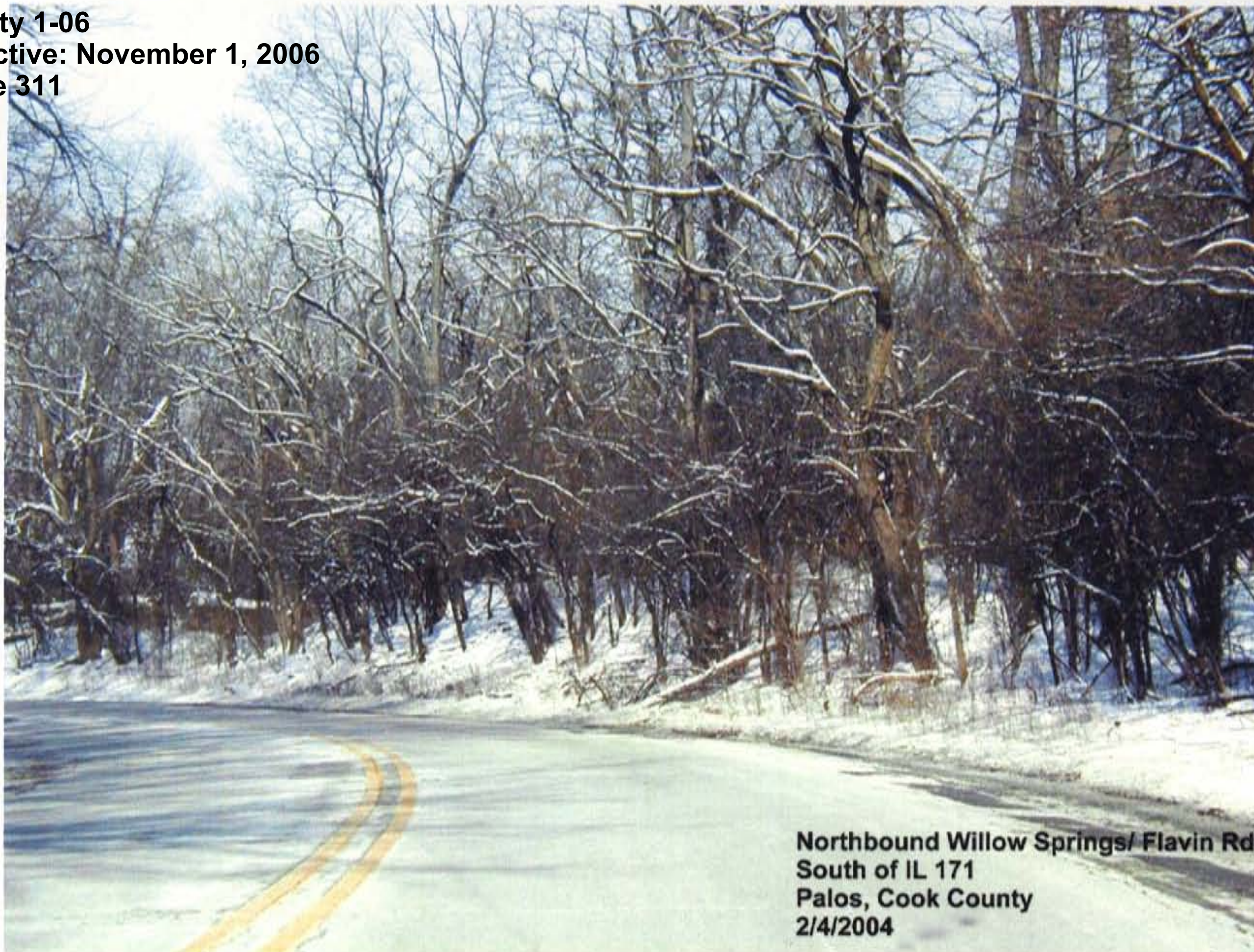


Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

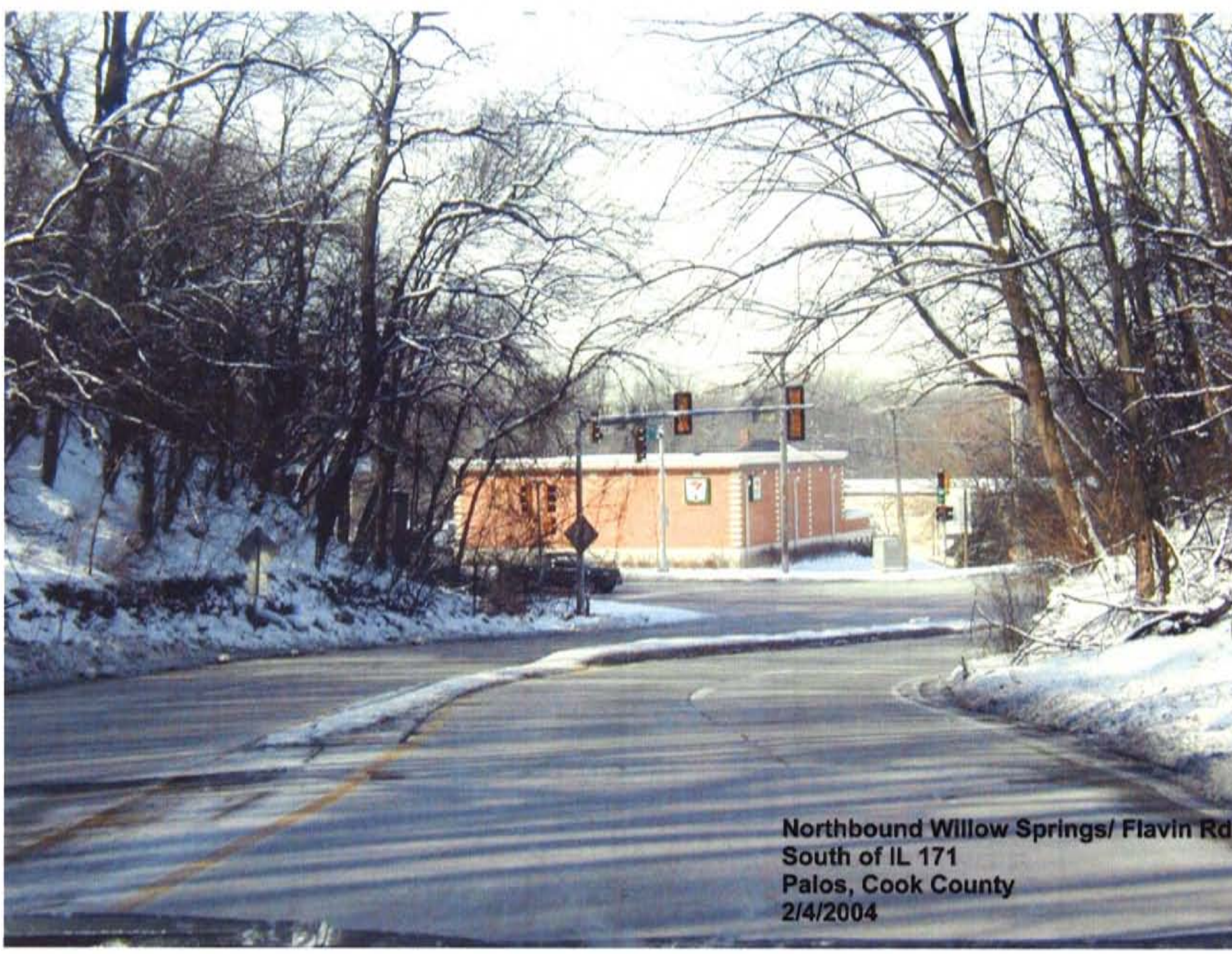
Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004


Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004


Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

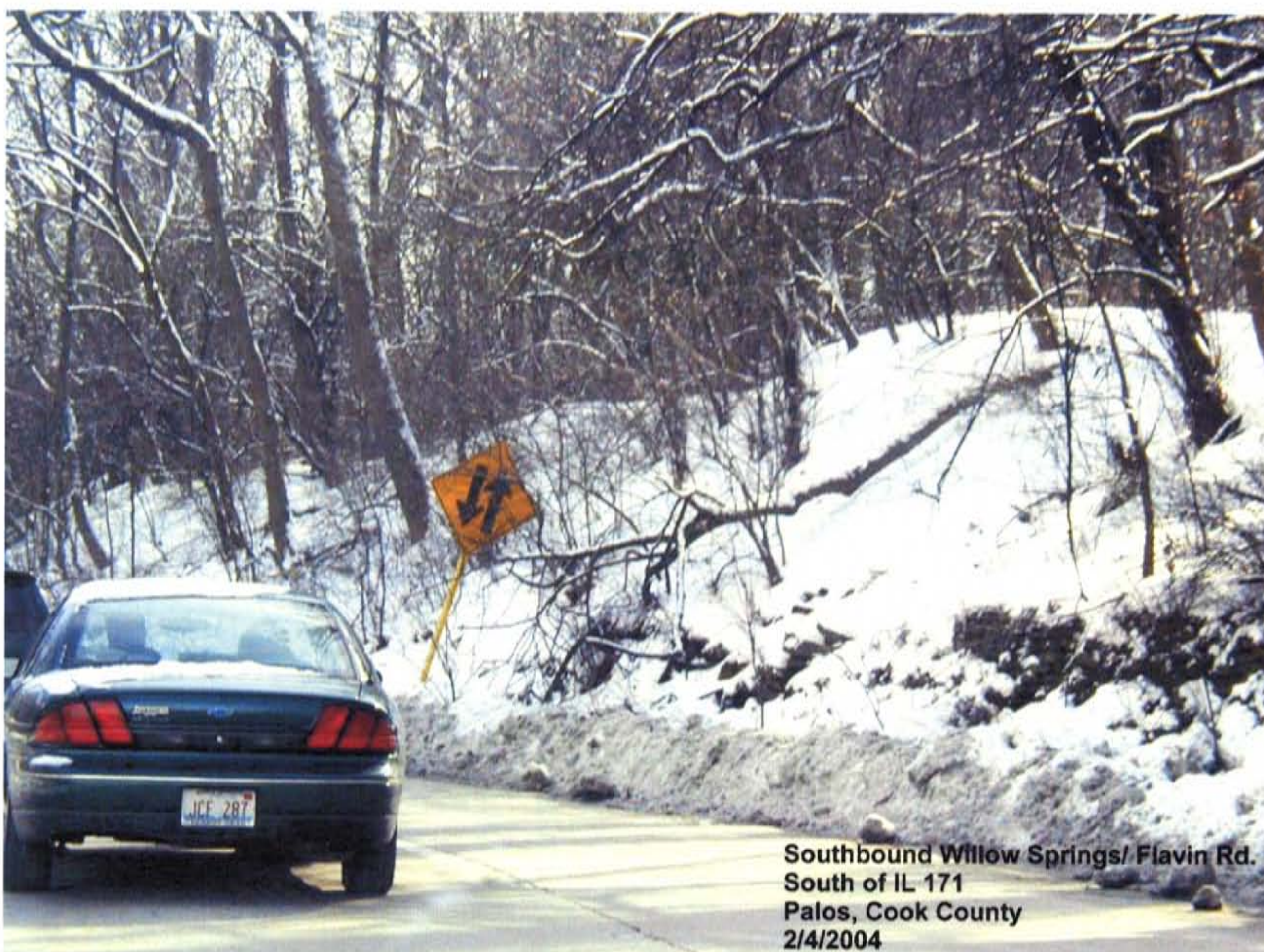


Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

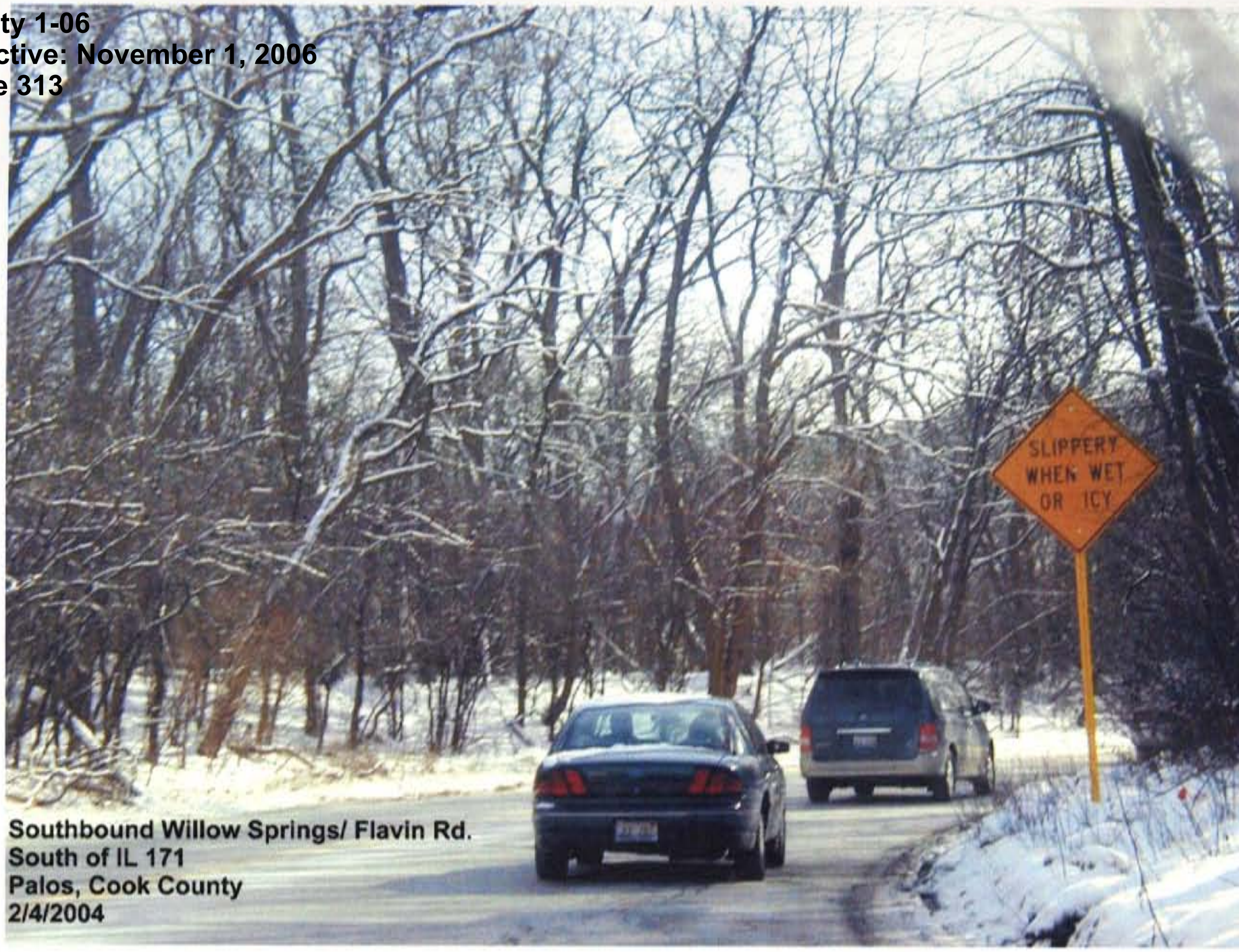


Northbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

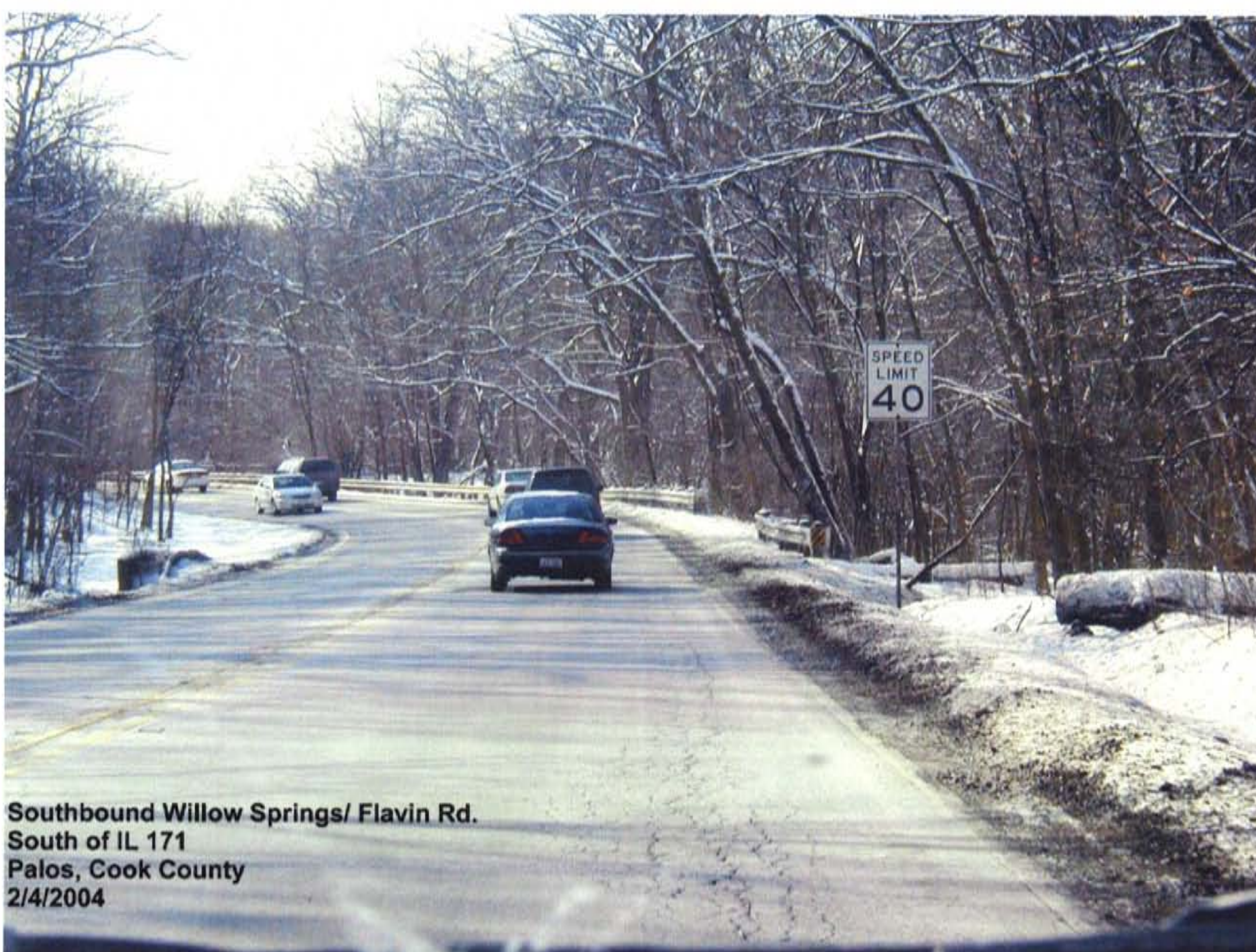
Southbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004



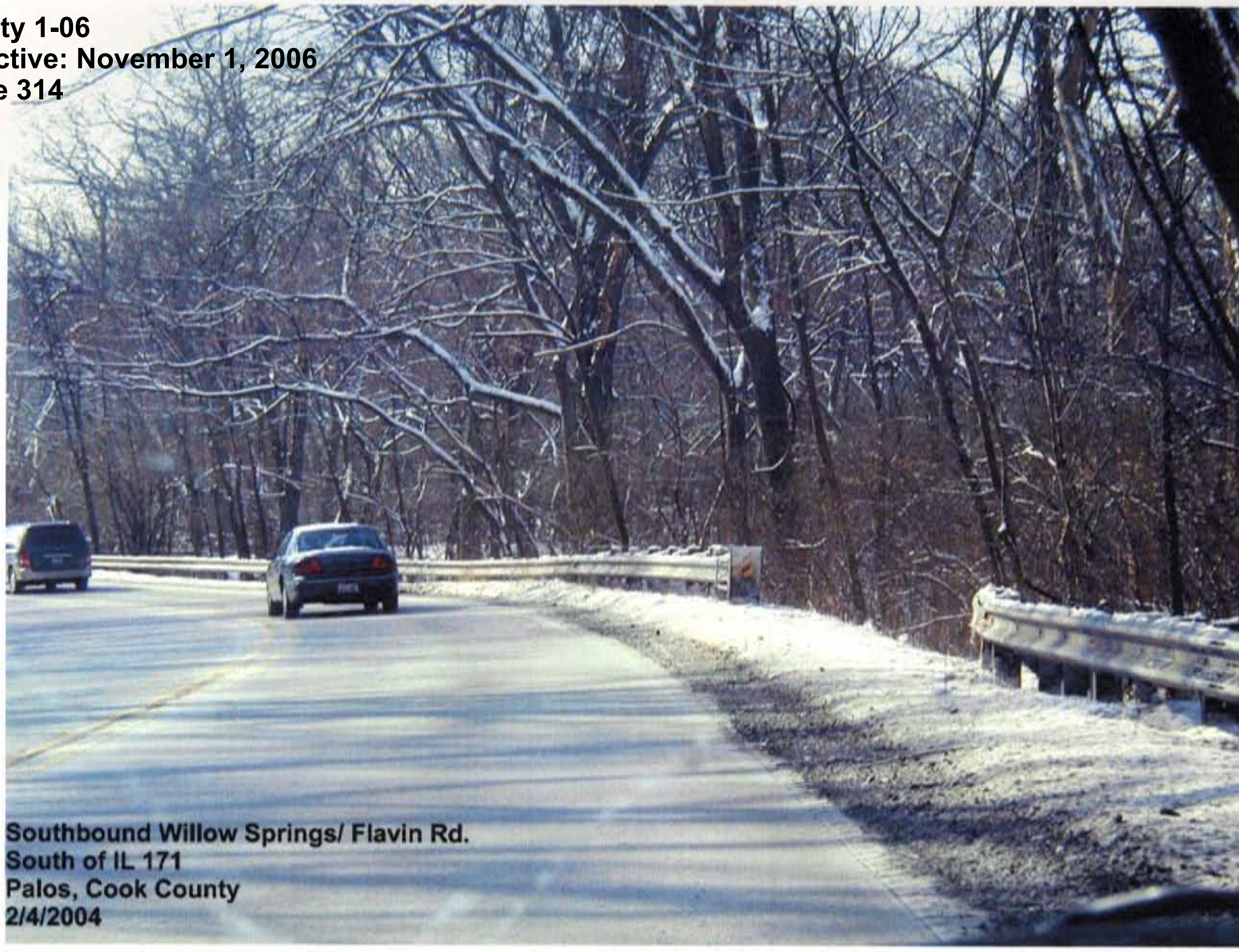
Southbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

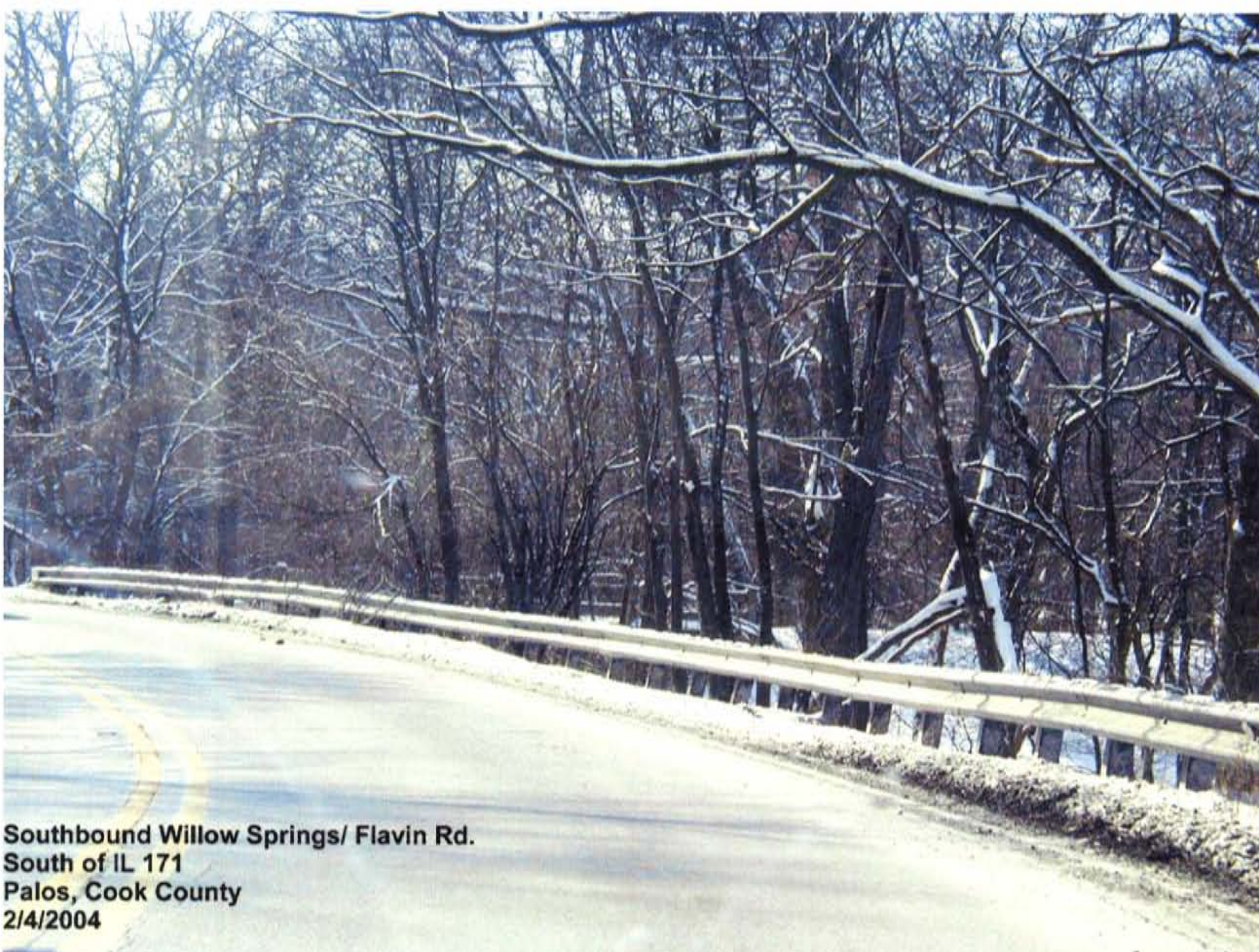


Southbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004



Southbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004


Southbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004


Southbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

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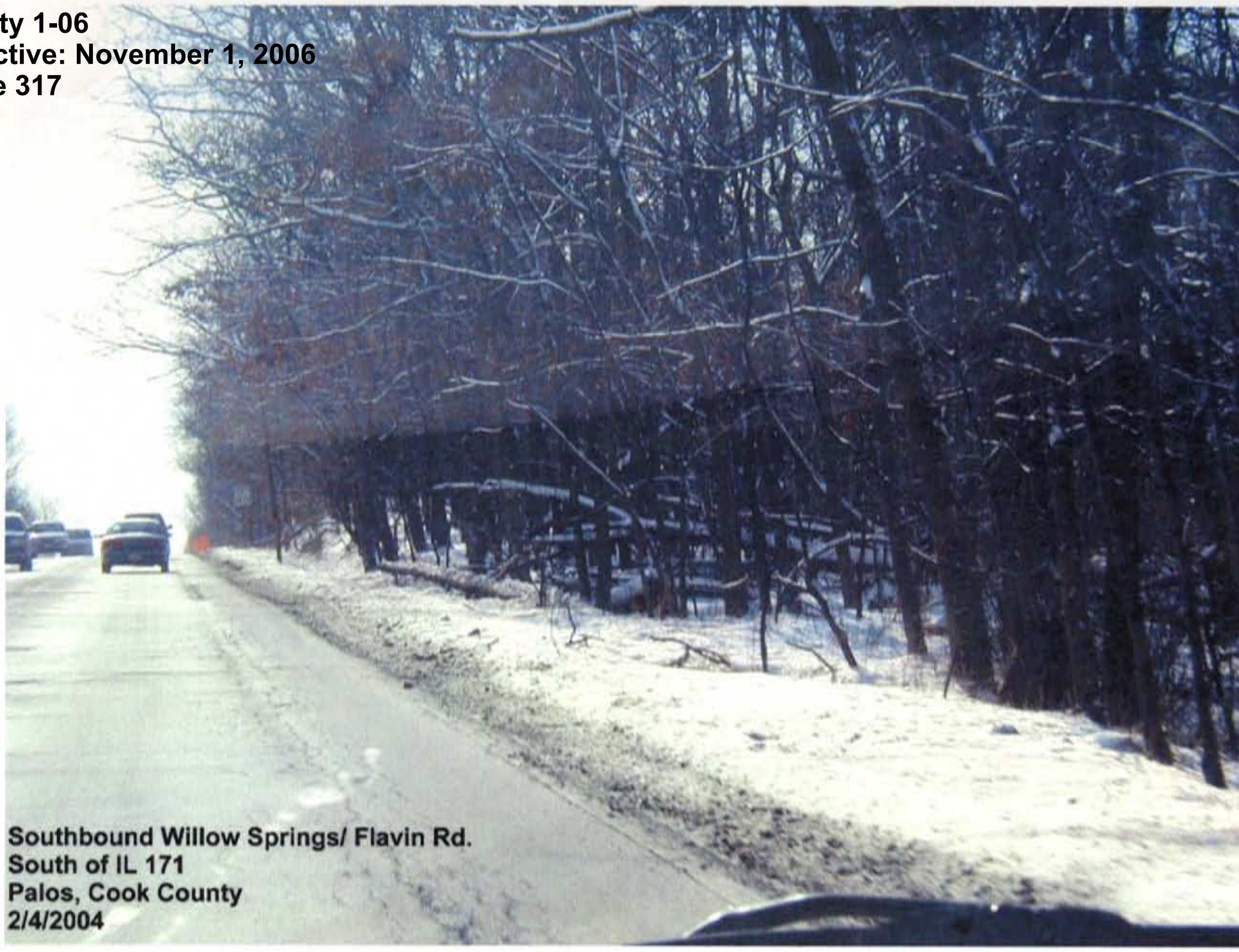
Southbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

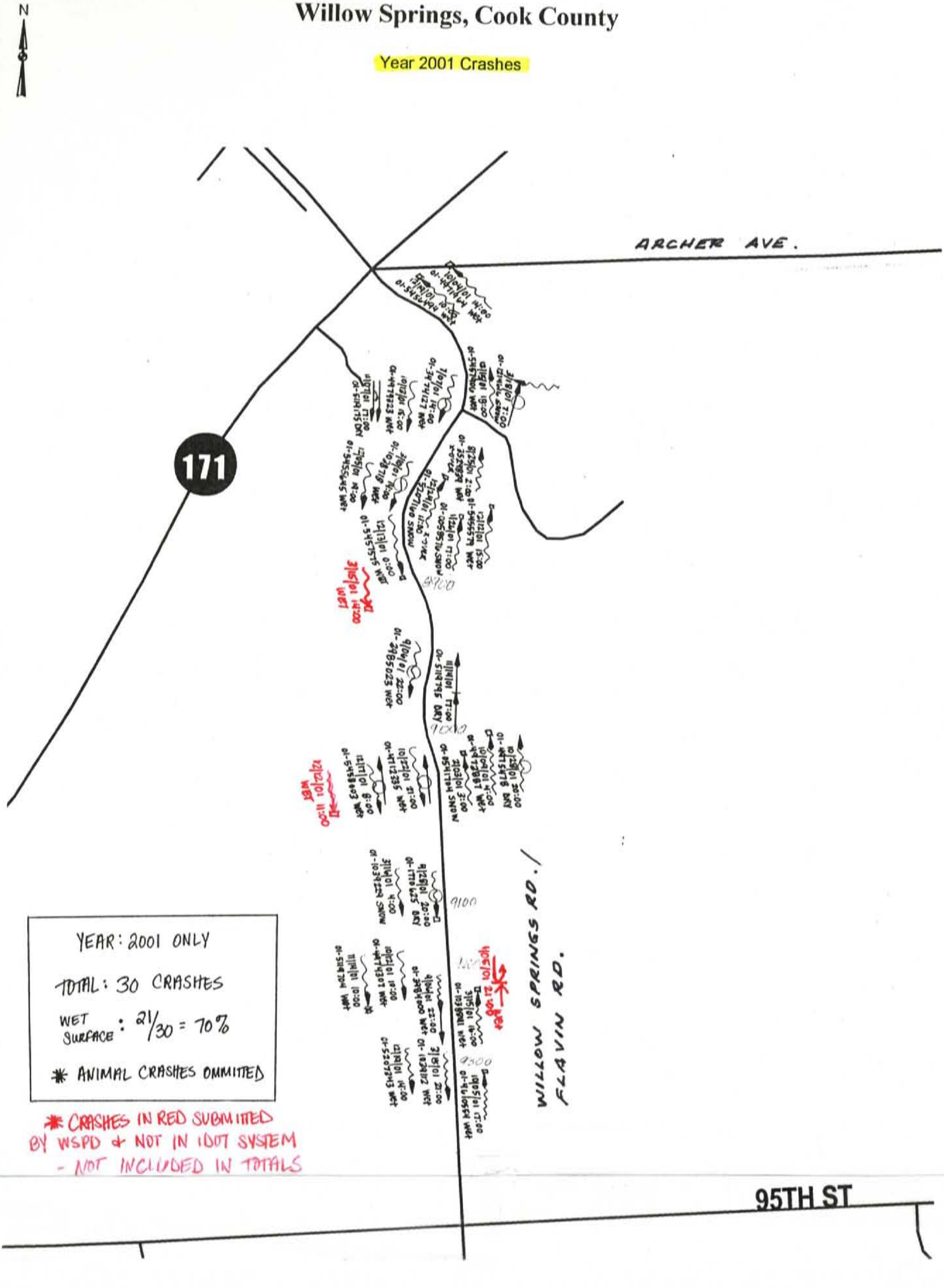


Southbound Willow Springs/ Flavin Rd.
South of IL 171
Palos, Cook County
2/4/2004

Willow Springs/Flavin Road (between IL 171 & 95th Street)

Willow Springs, Cook County

Year 2001 Crashes



GCA-P011 GCA-R01

ILLINOIS DEPARTMENT OF TRANSPORTATION

Date: 10/1/2004

GIS Crash Report Details

(C) Flavin Road (Year: 2001 Only)

Between IL 171 & 95th Street - Animal Crashes Omitted

Route	Mile	Case ID #	Collision Type	Surface /Weather	Crash Date Time		Direction	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
TS 119	1.74	01-1039112	FIXED ~~OTHER~~ OBJECT TREE	WET	03/15/01/	Veh_1	SOUTH	NORMAL	CAR	Skidding/Control	0	0	THU	NIGHT
				RAIN	21:00	Veh_2								
TS 119	1.74	01-4610554	FIXED OBJECT TREE	WET	10/05/01/	Veh_1	NORTH	NORMAL	CAR	Skidding/Control	0	0	FRI	DUSK
				RAIN	17:00	Veh_2								
TS 119	1.75	01-5207343	FIXED OBJECT DITCH	WET	12/19/01/	Veh_1	SOUTH	NORMAL	CAR	Skidding/Control	0	0	WED	DAY
				RAIN	14:00	Veh_2								
TS 119	1.86	01-1038841	FIXED OBJECT GD. RAIL	WET	03/15/01/	Veh_1	NORTH	NORMAL	VAN	Skidding/Control	0	0	THU	DUSK
				RAIN	16:00	Veh_2								
TS 119	1.86	01-3984000	REAR END	WET	09/06/01/	Veh_1	SOUTH	NORMAL	SUV	Skidding/Control	0	0	THU	NIGHT
				RAIN	22:00	Veh_2	SOUTH	NORMAL	PICKUP	Slow/stop in traffic				
TS 119	1.86	01-4974307	FIXED OBJECT TREE	WET	10/12/01/	Veh_1	SOUTH	NORMAL	CAR	Straight ahead	0	0	FRI	DAY
				RAIN	10:00	Veh_2								
TS 119	1.97	01-1770625	FIXED OBJECT GD. RAIL	DRY	04/28/01/	Veh_1	SOUTH	NORMAL	MOTORCYCL	Unknown/NA	0	1 B	SAT	NIGHT
				CLEAR	20:00	Veh_2								
TS 119	1.98	01-1039229	HEAD-ON	SNOW	03/16/01/	Veh_1	SOUTH	NORMAL	CAR	Skidding/Control	0	0	FRI	NIGHT
				SNOW	04:00	Veh_2	NORTH	NORMAL	CAR	Straight ahead				
TS 119	2.10	01-0541704	FIXED OBJECT TREE	SNOW	02/03/01/	Veh_1	NORTH	NORMAL	CAR	Skidding/Control	0	0	SAT	NIGHT
				SNOW	03:00	Veh_2								
TS 119	2.10	01-4712335	HEAD-ON	WET	10/22/01/	Veh_1	NW	NORMAL	CAR	Skidding/Control	0	3 A	MON	NIGHT
				RAIN	21:00	Veh_2	SOUTH	NORMAL	CAR	Straight ahead				
TS 119	2.10	01-5458003	REAR END	WET	12/17/01/	Veh_1	SOUTH	NORMAL	CAR	Skidding/Control	0	1 C	MON	DAY
				RAIN	08:00	Veh_2	NORTH	NORMAL	PICKUP	Straight ahead				
TS 119	2.11	01-4973887	FIXED OBJECT GD. RAIL	WET	10/09/01/	Veh_1	NORTH	NORMAL	CAR	Skidding/Control	0	0	TUE	NIGHT
				RAIN	04:00	Veh_2								

ILLINOIS DEPARTMENT OF TRANSPORTATION

GIS Crash Report Details

(C) Flavin Road (Year: 2001 Only)

Between IL 171 & 95th Street - Animal Crashes Omitted

Route	Mile	Case ID #	Collision Type	Surface /Weather	Crash Date Time		Direction	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
TS 119	2.11	01-4975478	VEHICLE OVERTU	DRY FOG/SMOG	10/28/01/ 20:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Straight ahead	0	1 B	SUN	NIGHT
TS 119	2.12	01-5119704	FIXED OBJECT ~~ANGLE~~ TREE	WET RAIN	11/14/01/ 10:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Avoiding	0	0	WED	DAY
TS 119	2.20	01-5119795	REAR END	DRY CLEAR	11/14/01/ 17:00	Veh_1 Veh_2	NORTH NORTH	NORMAL NORMAL	CAR CAR	Straight ahead Straight ahead	0	0	WED	NIGHT
TS 119	2.23	01-3985023	FIXED OBJECT ~~OTHER NONCOLL~~ TREE	WET RAIN	09/06/01/ 22:00	Veh_1 Veh_2	SOUTH	NORMAL	PICKUP	Skidding/Control	0	2 C	THU	NIGHT
TS 119	2.30	01-5457575	FIXED OBJECT TREE	WET RAIN	12/13/01/ 00:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Skidding/Control	0	0	THU	NIGHT
TS 119	2.35	01-5207160	FIXED OBJECT TREE	SNOW SNOW	12/24/01/ 11:00	Veh_1 Veh_2	NORTH	OTHER	CAR	Skidding/Control	0	0	MON	DAY
TS 119	2.36	01-0058576	FIXED OBJECT EMBANKMENT	SNOW SNOW	01/26/01/ 17:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Skidding/Control	0	0	FRI	DUSK
TS 119	2.36	01-1038718	OTHER OBJECT	WET RAIN	03/10/01/ 14:00	Veh_1 Veh_2	SOUTH	NORMAL	PICKUP	Unknown/NA	0	1 C	SAT	DAY
TS 119	2.36	01-5455579	FIXED OBJECT EMBANKMENT	WET RAIN	12/12/01/ 15:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Skidding/Control	0	0	WED	DAY
TS 119	2.36	01-5455645	FIXED OBJECT TREE	WET RAIN	12/05/01/ 19:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Straight ahead	0	0	WED	NIGHT
TS 119	2.37	01-3529839	OTHER OBJECT	WET CLEAR	08/25/01/ 02:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Straight ahead	0	0	SAT	NIGHT
TS 119	2.48	01-3474127	VEHICLE OVERTU	WET RAIN	07/07/01/ 14:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Skidding/Control	0	1 B	SAT	DAY

GCA-P011 GCA-R01

ILLINOIS DEPARTMENT OF TRANSPORTATION

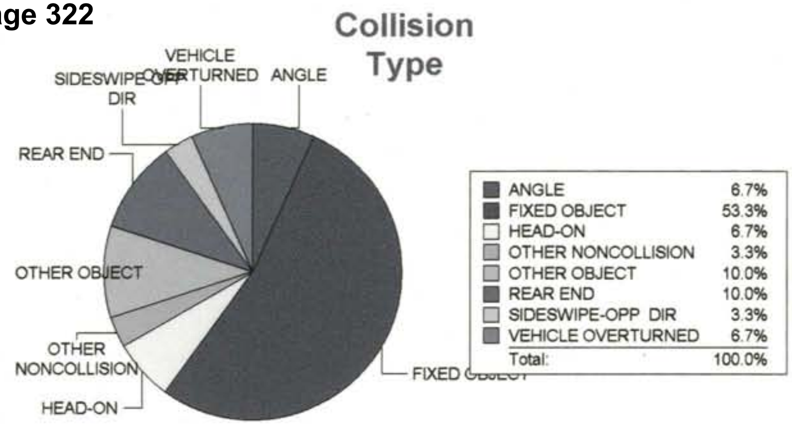
GIS Crash Report Details

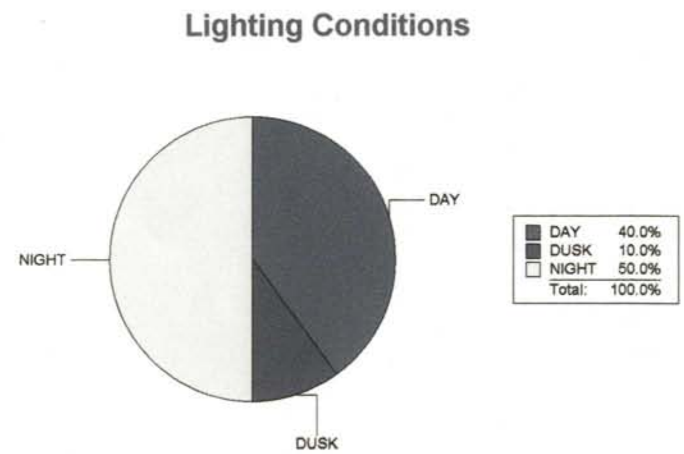
(C) Flavin Road (Year: 2001 Only)

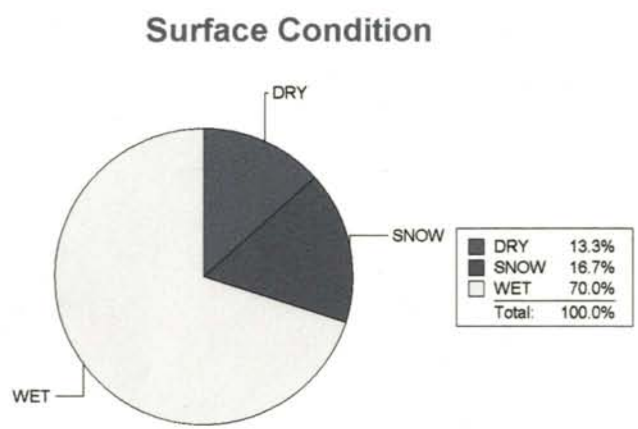
Between IL 171 & 95th Street - Animal Crashes Omitted

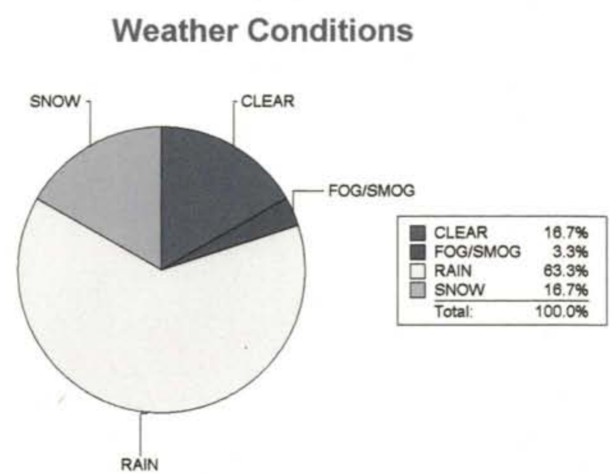
Route	Mile	Case ID #	Collision Type	Surface /Weather	Crash Date Time		Direction	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
TS 119	2.48	01-4974323	FIXED OBJECT TREE	WET RAIN	10/13/01/ 15:00	Veh_1 Veh_2	?	NORMAL	CAR	Skidding/Control	0	0	SAT	DAY
TS 119	2.48	01-5119175	SIDESWIPE-OPP D	DRY CLEAR	11/07/01/ 17:00	Veh_1 Veh_2	SOUTH SOUTH	NORMAL NORMAL	CAR VAN	Straight ahead Straight ahead	0	0	WED	NIGHT
TS 119	2.48	01-5457906	FIXED OBJECT DITCH	WET RAIN	12/15/01/ 18:00	Veh_1 Veh_2	NORTH	NORMAL	LARGE BUS	Slow/stop-right	0	0	SAT	NIGHT
TS 119	2.50	01-1214616	ANGLE	SNOW CLEAR	03/18/01/ 07:00	Veh_1 Veh_2	WEST NORTH	NORMAL NORMAL	CAR CAR	Straight ahead Straight ahead	0	1 C	SUN	DAY
TS 119	2.58	01-5456494	FIXED OBJECT TREE	WET SNOW	12/19/01/ 10:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Skidding/Control	0	0	WED	DAY
TS 119	2.59	01-4971964	FIXED OBJECT TREE	WET RAIN	10/04/01/ 14:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Skidding/Control	0	0	THU	DAY

Total Injuries: 11 **Total Fatalities:** 0 **Total Crashes:** 30

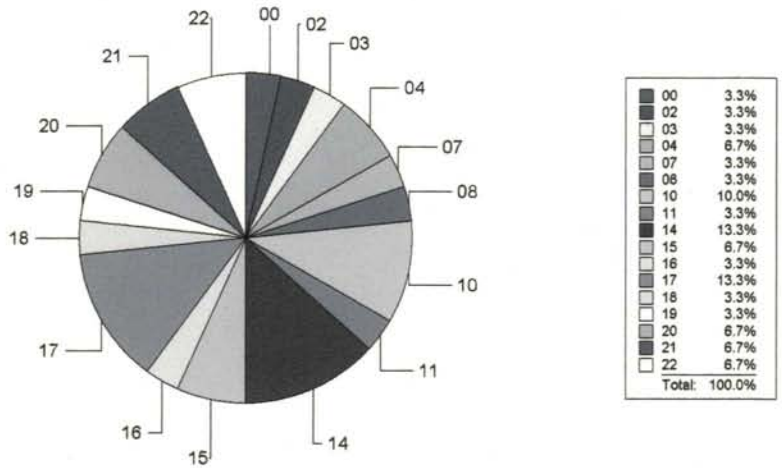

Collision Type
VEHICLE OVERTURNED
ANGLE
SIDESWIPE-OPP DIR
REAR END
OTHER OBJECT
OTHER NONCOLLISION
HEAD-ON
FIXED OBJECT
ANGLE 6.7%
FIXED OBJECT 53.3%
HEAD-ON 6.7%
OTHER NONCOLLISION 3.3%
OTHER OBJECT 10.0%
REAR END 10.0%
SIDESWIPE-OPP DIR 3.3%
VEHICLE OVERTURNED 6.7%
Total: 100.0%


Lighting Conditions
DAY
NIGHT
DUSK
DAY 40.0%
DUSK 10.0%
NIGHT 50.0%
Total: 100.0%

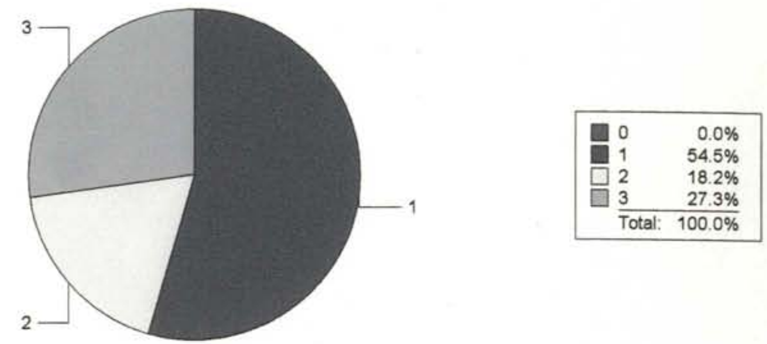

Surface Condition
DRY
SNOW
WET
DRY 13.3%
SNOW 16.7%
WET 70.0%
Total: 100.0%


Weather Conditions
SNOW
CLEAR
FOG/SMOG
RAIN
CLEAR 16.7%
FOG/SMOG 3.3%
RAIN 63.3%
SNOW 16.7%
Total: 100.0%

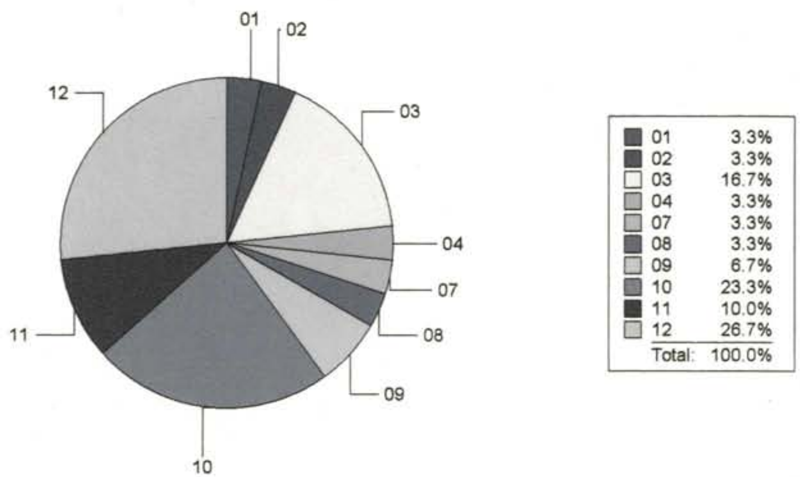
Time of Day



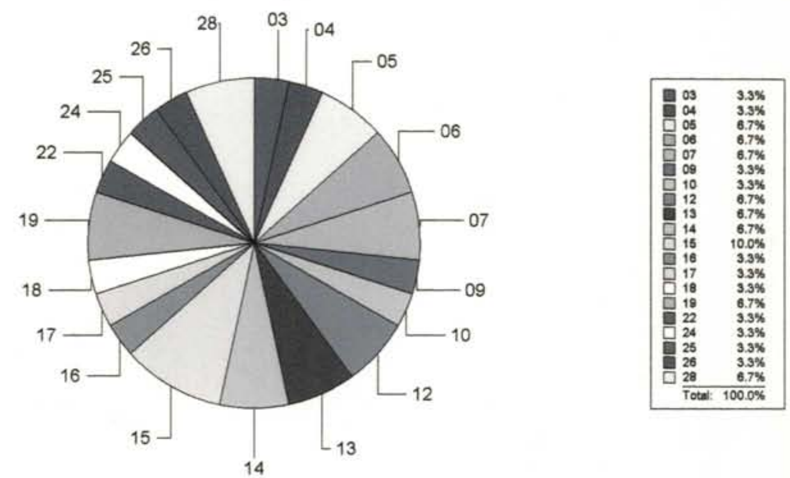
Injuries Per Crash



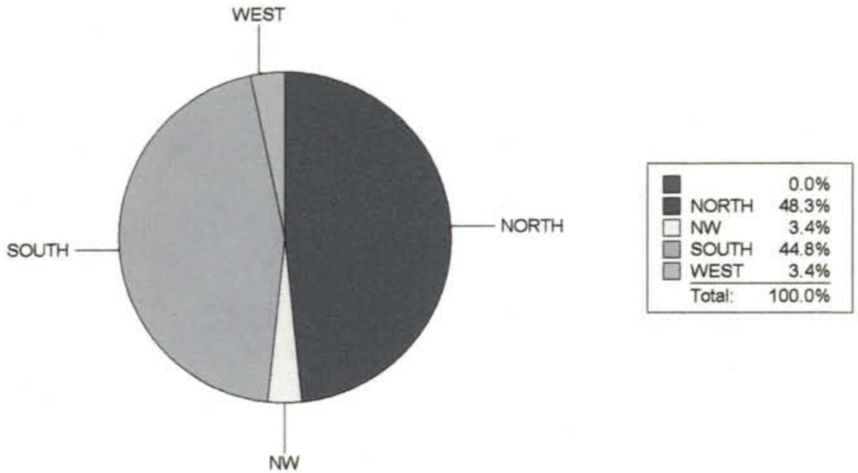
Month of Year



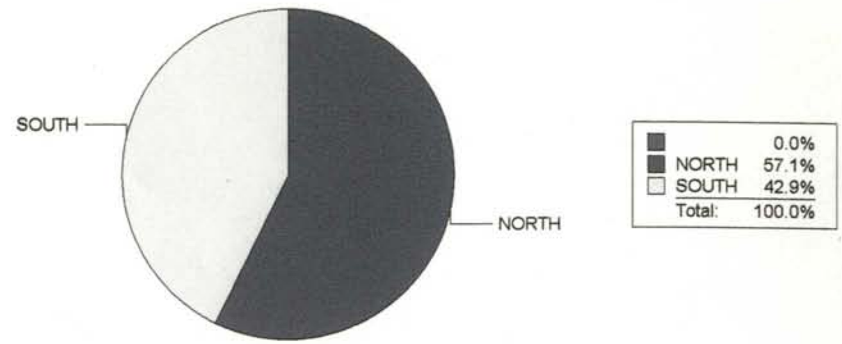
Day of Week



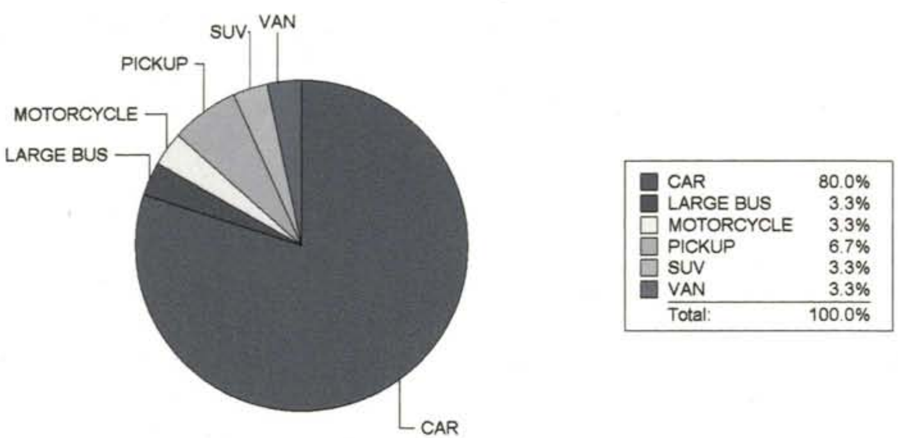
Direction of Travel - Vehicle 1



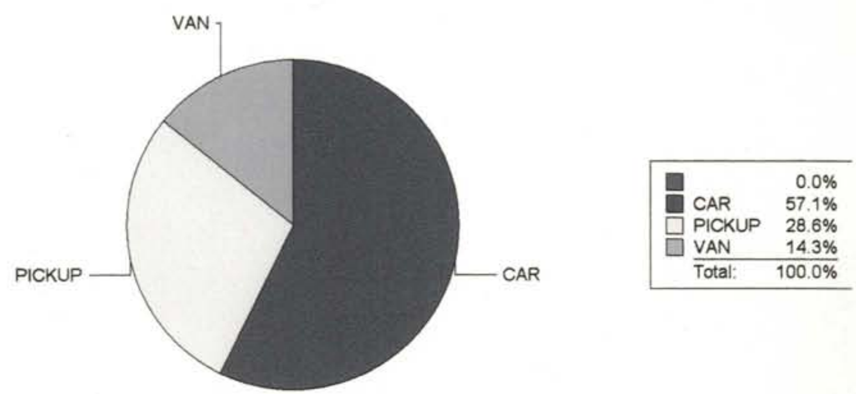
Direction of Travel - Vehicle 2



Vehicle 1 - Type



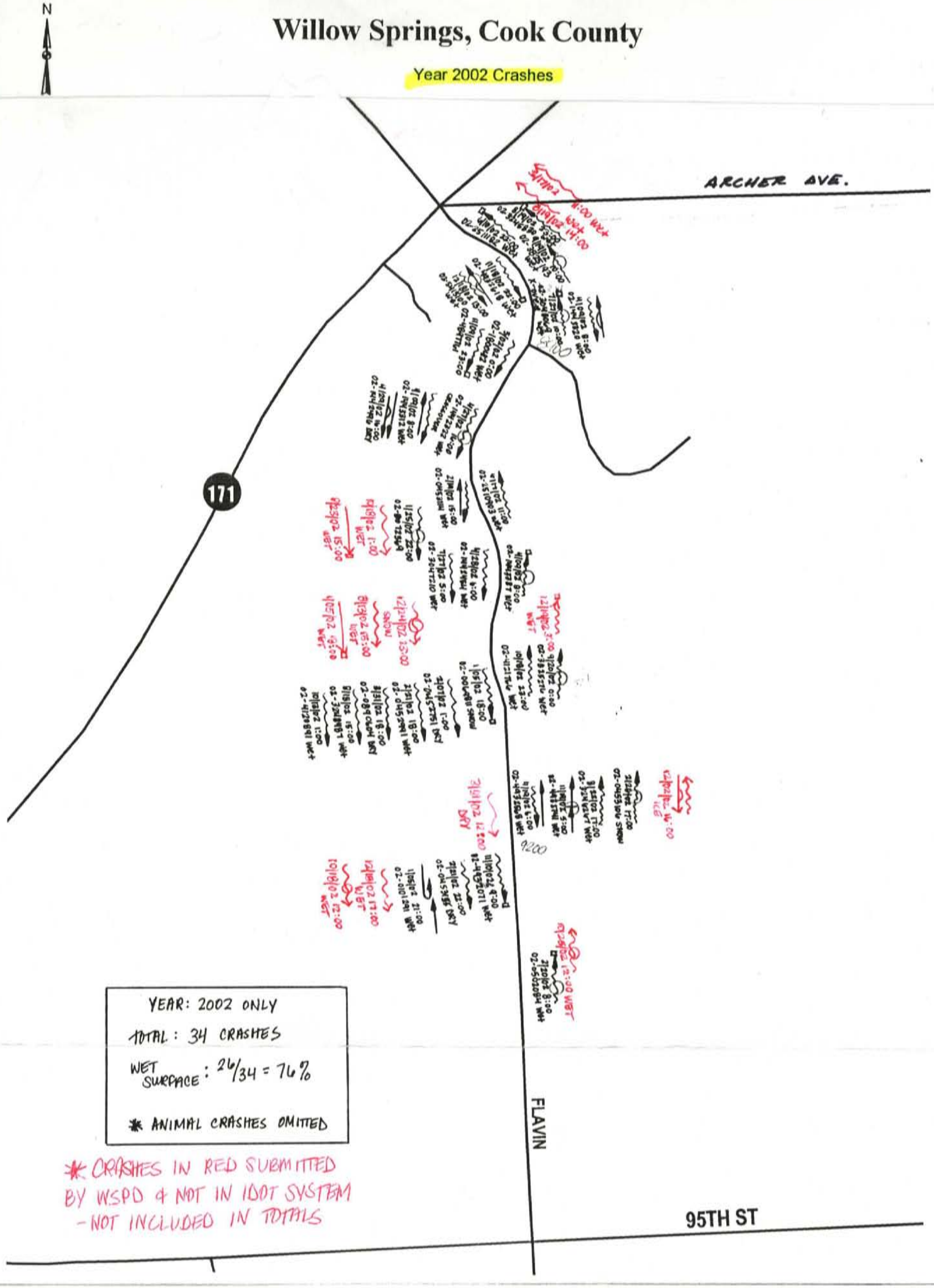
Vehicle 2 - Type



Willow Springs/Flavin Road (between IL 171 & 95th Street)

Willow Springs, Cook County

Year 2002 Crashes



YEAR: 2002 ONLY
TOTAL: 34 CRASHES
WET SURFACE: 26/34 = 76%
* ANIMAL CRASHES OMITTED

* CRASHES IN RED SUBMITTED BY WSPD & NOT IN IDOT SYSTEM - NOT INCLUDED IN TOTALS

ILLINOIS DEPARTMENT OF TRANSPORTATION

GIS Crash Report Details

(C) Flavin Road (Year: 2002 Only)

Between IL 171 & 95th Street - Animal Crashes Omitted

Route	Mile	Case ID #	Collision Type	Surface /Weather	Crash Date Time		Direction	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
TS 119	1.60	02-1800412	OTHER NONCOLL	WET RAIN	05/02/02/ 00:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Straight ahead	0	0	THU	NIGHT
TS 119	1.75	02-0502084	FIXED OBJECT TREE	WET RAIN	02/20/02/ 08:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Straight ahead	0	1 B	WED	DAY
TS 119	1.80	02-4932071	FIXED OBJECT DITCH	WET CLEAR	11/10/02/ 09:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Skidding/Control	0	0	SUN	DAY
TS 119	1.86	02-0453155	FIXED OBJECT DITCH	DRY CLEAR	02/21/02/ 22:00	Veh_1 Veh_2	SOUTH	DRINKING	PICKUP	Unknown/NA	0	0	THU	NIGHT
TS 119	1.89	02-0101291	REAR END	WET SNOW	01/05/02/ 21:00	Veh_1 Veh_2	NORTH	NORMAL OTHER	CAR	Slow/stop in traffic Slow/stop-right	0	0	SAT	NIGHT
TS 119	1.90	02-4932568	SIDESWIPE-OPP D	WET RAIN	11/19/02/ 06:00	Veh_1 Veh_2	SOUTH NORTH	NORMAL NORMAL	PICKUP CAR	Skidding/Control Straight ahead	0	0	TUE	DAY
TS 119	1.90	02-4932741	REAR END	WET CLEAR	11/19/02/ 05:00	Veh_1 Veh_2	NORTH NORTH	NORMAL NORMAL	CAR VAN	Straight ahead Straight ahead	0	1 B	TUE	DAY
TS 119	1.98	02-3246267	FIXED OBJECT TREE	WET RAIN	08/22/02/ 17:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Skidding/Control	0	0	THU	DAY
TS 119	2.00	02-0453106	FIXED OBJECT TREE	SNOW	02/26/02/ 17:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Skidding/Control	0	1 B	TUE	DAY
TS 119	2.10	02-0069811	FIXED OBJECT TREE	SNOW SNOW	01/05/02/ 18:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Straight ahead	0	0	SAT	NIGHT
TS 119	2.10	02-0452751	FIXED OBJECT TREE	DRY CLEAR	02/07/02/ 01:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Turning right	0	0	THU	NIGHT
TS 119	2.10	02-0452991	OTHER OBJECT DITCH	WET RAIN	02/21/02/ 18:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Skidding/Control	0	0	THU	DAY

ILLINOIS DEPARTMENT OF TRANSPORTATION

GIS Crash Report Details

(C) Flavin Road (Year: 2002 Only)

Between IL 171 & 95th Street - Animal Crashes Omitted

Route	Mile	Case ID #	Collision Type	Surface /Weather	Crash Date Time		Direction	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
TS 119	2.10	02-0890604	OTHER OBJECT	DRY CLEAR	03/31/02/ 18:00	Veh_1 Veh_2	SOUTH	ALCOHOL	CAR	Avoiding	0	0	SUN	DUSK
TS 119	2.10	02-3248487	CAN NOT RETRIEVE OTHER OBJECT FILE	WET RAIN	08/18/02/ 15:00	Veh_1 Veh_2	SOUTH	NORMAL	PICKUP	Straight ahead	0	0	SUN	DAY
TS 119	2.10	02-4120891	OTHER NONCOLL	WET RAIN	10/13/02/ 01:00	Veh_1 Veh_2	SW	NORMAL	CAR	Skidding/Control	0	0	SUN	NIGHT
TS 119	2.10	02-4121766	FIXED OBJECT DITCH	WET CLEAR	10/18/02/ 23:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Skidding/Control	0	0	FRI	NIGHT
TS 119	2.21	02-3825276	VEHICLE OVERTU	WET RAIN	09/20/02/ 00:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Skidding/Control	0	1 C	FRI	NIGHT
TS 119	2.22	02-1443387	FIXED OBJECT TREE	WET RAIN	04/09/02/ 08:00	Veh_1 Veh_2	NE	NORMAL	CAR	Skidding/Control	0	1 B	TUE	DAY
TS 119	2.23	02-1442454	FIXED OBJECT GD. RAIL	WET RAIN	04/28/02/ 06:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Skidding/Control	0	0	SUN	DAWN
TS 119	2.24	02-3047210	FIXED OBJECT TREE	WET RAIN	07/27/02/ 05:00	Veh_1 Veh_2	SOUTH	OTHER	CAR	Skidding/Control	0	0	SAT	DAWN
TS 119	2.34	02-0453114	ANGLE	WET RAIN	02/19/02/ 15:00	Veh_1 Veh_2	SOUTH NORTH	NORMAL NORMAL	CAR PICKUP	Skidding/Control Straight ahead	0	0	TUE	DAY
TS 119	2.34	02-2510903	FIXED OBJECT TREE	WET RAIN	06/17/02/ 11:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Skidding/Control	0	0	MON	DAY
TS 119	2.35	02-1442322	VEHICLE OVERTU	WET RAIN	04/27/02/ 16:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Skidding/Control	0	1 B	SAT	DAY
TS 119	2.37	02-1443312	SIDESWIPE-OPP D	WET RAIN	04/09/02/ 08:00	Veh_1 Veh_2	NORTH SOUTH	NORMAL NORMAL	PICKUP CAR	Straight ahead Straight ahead	0	0	TUE	DAY

ILLINOIS DEPARTMENT OF TRANSPORTATION

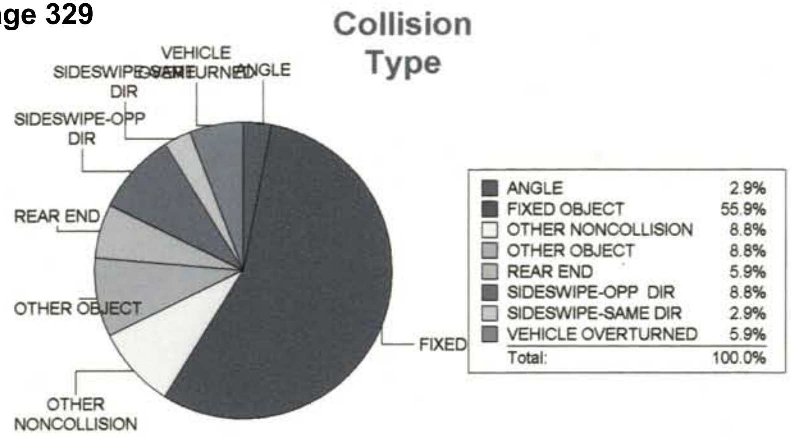
GIS Crash Report Details

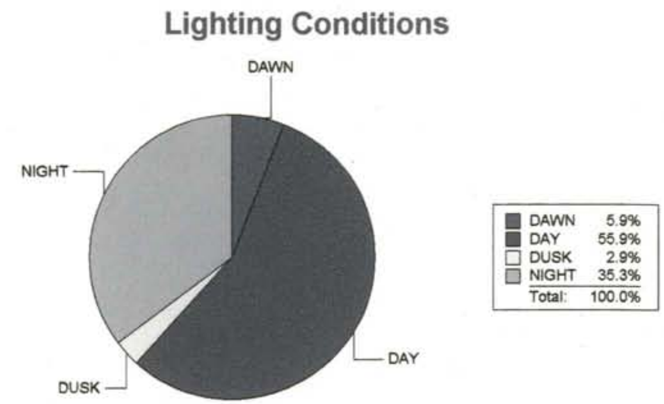
(C) Flavin Road (Year: 2002 Only)

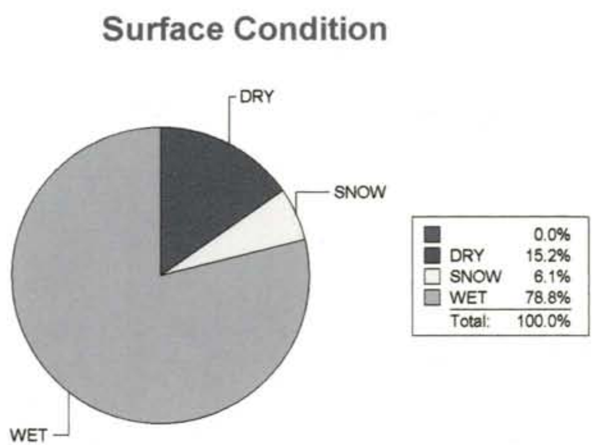
Between IL 171 & 95th Street - Animal Crashes Omitted

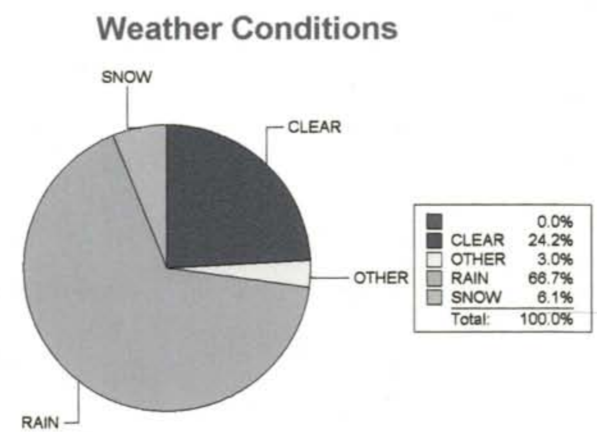
Route	Mile	Case ID #	Collision Type	Surface /Weather	Crash Date Time		Direction	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
TS 119	2.40	02-4897761	FIXED OBJECT		11/09/02/	Veh_1	NE	NORMAL	CAR	Unknown/NA	0	0	SAT	NIGHT
			TREE	RAIN	23:00	Veh_2								
TS 119	2.45	02-0072369	FIXED OBJECT	DRY	01/25/02/	Veh_1	SOUTH	OTHER	PICKUP	Skidding/Control	0	1 B	FRI	NIGHT
			DITCH	CLEAR	22:00	Veh_2								
TS 119	2.47	02-1442496	SIDESWIPE-SAME	DRY	04/29/02/	Veh_1	SOUTH	NORMAL	PICKUP	Straight ahead	0	0	MON	DAY
				CLEAR	16:00	Veh_2	SOUTH	NORMAL	VAN	Merging				
TS 119	2.48	02-3048069	FIXED OBJECT	WET	07/27/02/	Veh_1	NORTH	NORMAL	SUV	Skidding/Control	0	1 B	SAT	DAY
			DITCH	RAIN	10:00	Veh_2								
TS 119	2.49	02-1443320	FIXED OBJECT	WET	04/09/02/	Veh_1	NE NORTH	NORMAL	CAR	Avoiding	0	0	TUE	DAY
			GD RAIL	RAIN	08:00	Veh_2	SOUTH	OTHER	-					
TS 119	2.56	02-3825193	FIXED OBJECT	WET	09/19/02/	Veh_1	NORTH	NORMAL	CAR	Skidding/Control	0	1 C	THU	DAY
			EMBANKMENT	OTHER	10:00	Veh_2								
TS 119	2.56	02-4932618	OTHER NONCOLL	WET	11/18/02/	Veh_1	SOUTH	NORMAL	VAN	Skidding/Control	0	0	MON	NIGHT
				RAIN	22:00	Veh_2								
TS 119	2.56	02-5415100	SIDESWIPE-OPP D	WET	12/18/02/	Veh_1	NORTH	NORMAL	CAR	Skidding/Control	0	1 C	WED	DAY
				RAIN	13:00	Veh_2	SOUTH	NORMAL	CAR	Straight ahead				
TS 119	2.59	02-2511182	FIXED OBJECT	WET	06/10/02/	Veh_1	SOUTH	NORMAL	CAR	Straight ahead	0	0	MON	NIGHT
			TREE	RAIN	22:00	Veh_2								
TS 119	2.59	02-3245830	FIXED OBJECT	WET	08/19/02/	Veh_1	NORTH	NORMAL	SUV	Straight ahead	0	0	MON	DAY
			EMBANKMENT	RAIN	23:00	Veh_2								

Total Injuries: 10 **Total Fatalities:** 0 **Total Crashes:** 34

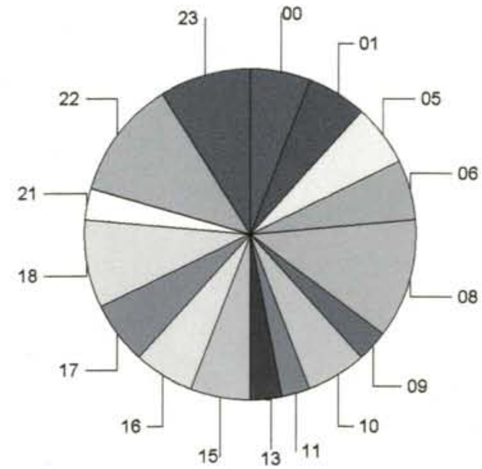

Collision Type
ANGLE 2.9%
FIXED OBJECT 55.9%
OTHER NONCOLLISION 8.8%
OTHER OBJECT 8.8%
REAR END 5.9%
SIDESWIPE-OPP DIR 8.8%
SIDESWIPE-SAME DIR 2.9%
VEHICLE OVERTURNED 5.9%
Total: 100.0%
VEHICLE OVERTURNED
ANGLE
SIDESWIPE-SAME DIR
SIDESWIPE-OPP DIR
REAR END
OTHER OBJECT
OTHER NONCOLLISION
FIXED


Lighting Conditions
DAWN 5.9%
DAY 55.9%
DUSK 2.9%
NIGHT 35.3%
Total: 100.0%
DAWN
NIGHT
DUSK
DAY


Surface Condition
0.0%
DRY 15.2%
SNOW 6.1%
WET 78.8%
Total: 100.0%
DRY
SNOW
WET


Weather Conditions
0.0%
CLEAR 24.2%
OTHER 3.0%
RAIN 66.7%
SNOW 6.1%
Total: 100.0%
SNOW
CLEAR
OTHER
RAIN

Time of Day

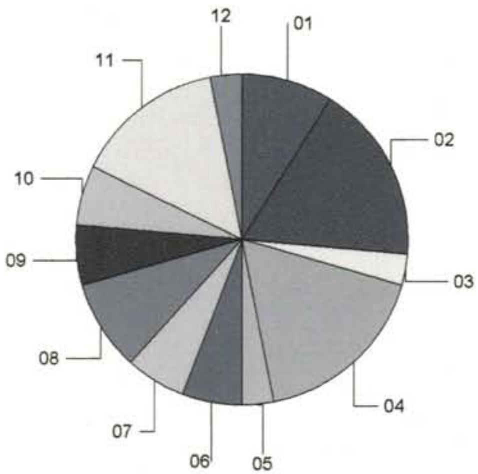


00	5.9%
01	5.9%
05	5.9%
06	5.9%
08	11.8%
09	2.9%
10	5.9%
11	2.9%
13	2.9%
15	5.9%
16	5.9%
17	5.9%
18	8.8%
21	2.9%
22	11.8%
23	8.8%
Total:	100.0%

Injuries Per Crash

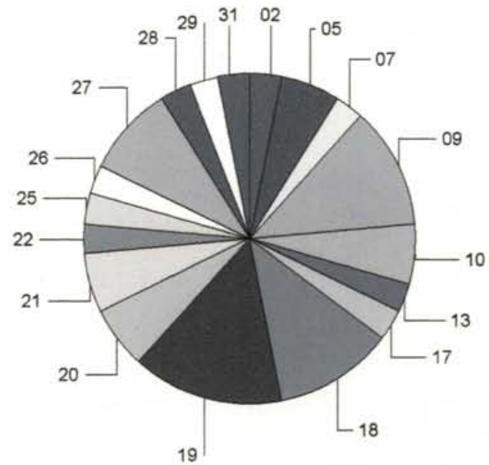
0	0.0%
1	100.0%
Total:	100.0%

Month of Year



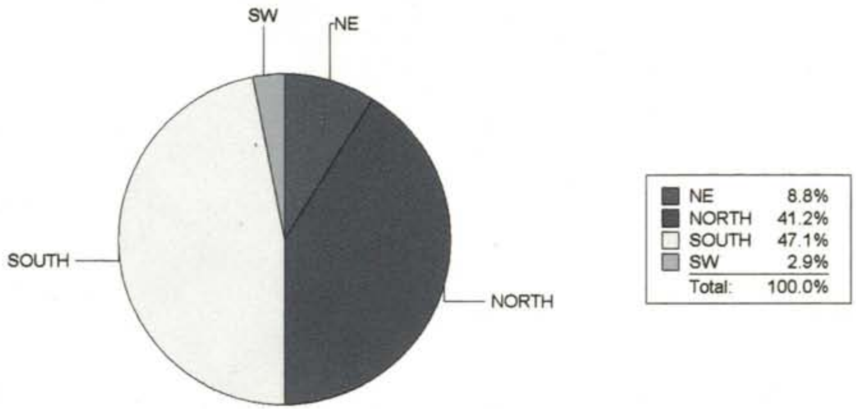
01	8.8%
02	17.6%
03	2.9%
04	17.6%
05	2.9%
06	5.9%
07	5.9%
08	8.8%
09	5.9%
10	5.9%
11	14.7%
12	2.9%
Total:	100.0%

Day of Week

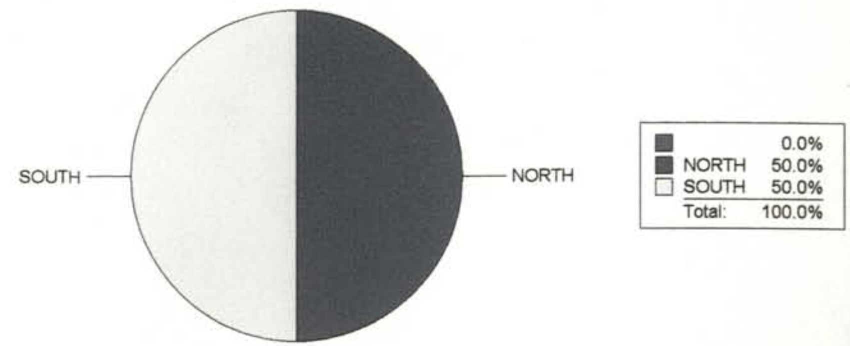


02	2.9%
05	5.9%
07	2.9%
09	11.8%
10	5.9%
13	2.9%
17	2.9%
18	11.8%
19	14.7%
20	5.9%
21	5.9%
22	2.9%
25	2.9%
26	2.9%
27	8.8%
28	2.9%
29	2.9%
31	2.9%
Total:	100.0%

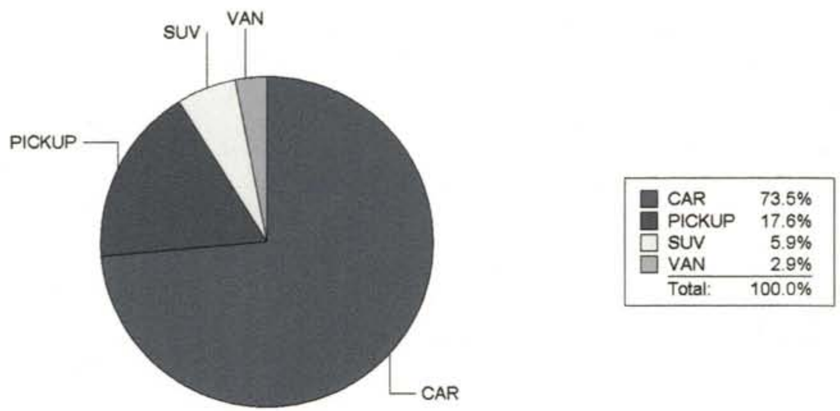
Direction of Travel - Vehicle 1



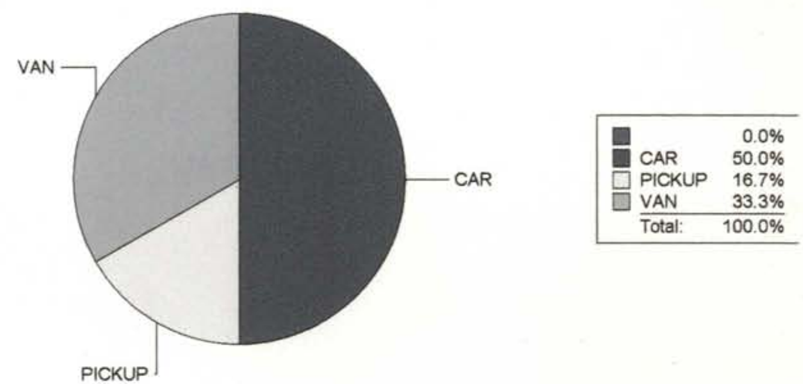
Direction of Travel - Vehicle 2



Vehicle 1 - Type



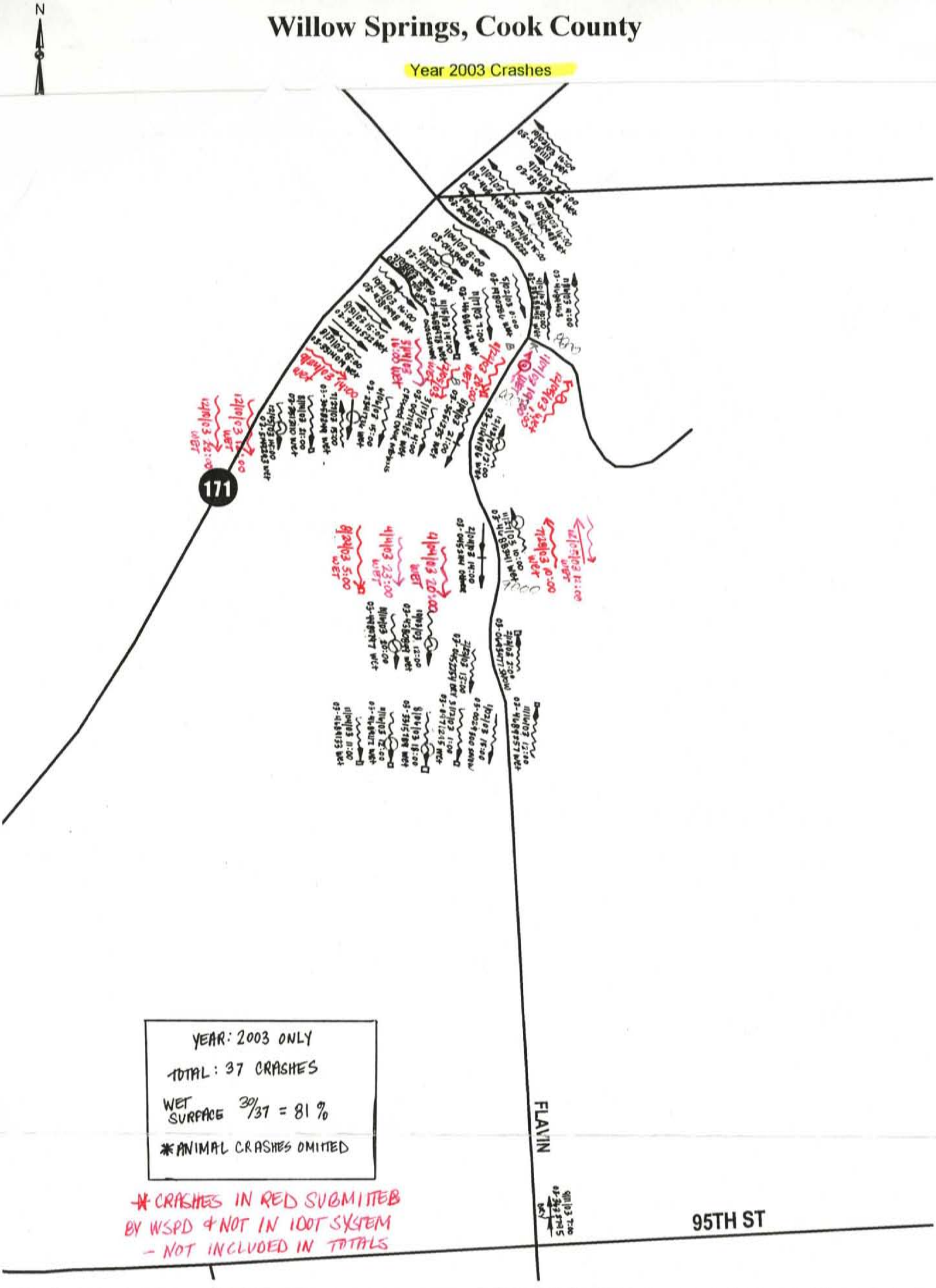
Vehicle 2 - Type



Willow Springs/Flavin Road (between IL 171 & 95th Street)

Willow Springs, Cook County

Year 2003 Crashes



GCA-F011 GCA-R01

ILLINOIS DEPARTMENT OF TRANSPORTATION

GIS Crash Report Details

(C) Flavin Road (Year: 2003 Only)

Between IL 171 & 95th Street - Animal Crashes Omitted

Route	Mile	Case ID #	Collision Type	Surface /Weather	Crash Date Time		Direction	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
TS 119	1.56	03-3632795	REAR END	DRY	09/11/03/	Veh_1	NORTH	NORMAL	CAR	Straight ahead	0	0	THU	DAY
				CLEAR	07:00	Veh_2	NORTH	NORMAL	VAN	Straight ahead				
TS 119	2.00	03-0029300	FIXED OBJECT	SNOW	01/02/03/	Veh_1	SOUTH	NORMAL	CAR	Skidding/Control	0	0	THU	DAY
			TREES	SNOW	15:00	Veh_2								
TS 119	2.00	03-0971295	FIXED OBJECT	WET	03/12/03/	Veh_1	SOUTH	OTHER	CAR	Unknown/NA	0	1 A	WED	NIGHT
			TREE	CLEAR	01:00	Veh_2								
TS 119	2.00	03-3315789	FIXED OBJECT	WET	08/06/03/	Veh_1	SOUTH	NORMAL	CAR	Skidding/Control	0	1 B	WED	DUSK
			STONE WALL	RAIN	18:00	Veh_2								
TS 119	2.00	03-4689117	FIXED OBJECT	WET	11/16/03/	Veh_1	NORTH	NORMAL	CAR	Skidding/Control	0	2 C	SUN	DAY
			GD. RAIL	RAIN	12:00	Veh_2								
TS 119	2.00	03-4689133	FIXED OBJECT	WET	11/04/03/	Veh_1	SOUTH	NORMAL	CAR	Straight ahead	0	0	TUE	DAY
			TREE	RAIN	11:00	Veh_2								
TS 119	2.00	03-4689257	FIXED OBJECT	WET	11/16/03/	Veh_1	NORTH	NORMAL	CAR	Straight ahead	0	0	SUN	DAY
			TREE	RAIN	12:00	Veh_2								
TS 119	2.03	03-0452254	OTHER NONCOLL	DRY	02/23/03/	Veh_1	SOUTH	NORMAL	CAR	Skidding/Control	0	0	SUN	DAY
			WOODED RAVINE	CLEAR	13:00	Veh_2								
TS 119	2.10	03-0693477	FIXED OBJECT	SNOW	02/13/03/	Veh_1	NORTH	NORMAL	CAR	Straight ahead	0	0	THU	NIGHT
			TREE	CLEAR	02:00	Veh_2								
TS 119	2.10	03-4380899	VEHICLE OVERTU	WET	10/03/03/	Veh_1	SOUTH	NORMAL	SUV	Skidding/Control	0	1 A	FRI	DAY
				RAIN	12:00	Veh_2								
TS 119	2.10	03-4980797	VEHICLE OVERTU	WET	11/16/03/	Veh_1	SOUTH	NORMAL	CAR	Straight ahead	0	1 C	SUN	NIGHT
			DITCH	FOG/SMOG	20:00	Veh_2								
TS 119	2.21	03-0452114	REAR END	OTHER	02/04/03/	Veh_1	SOUTH	NORMAL	PICKUP	Straight ahead	0	0	TUE	DAY
				OTHER	14:00	Veh_2	SOUTH	NORMAL	CAR	Straight ahead				

4 7

ILLINOIS DEPARTMENT OF TRANSPORTATION

GIS Crash Report Details

(C) Flavin Road (Year: 2003 Only)

Between IL 171 & 95th Street - Animal Crashes Omitted

Route	Mile	Case ID #	Collision Type	Surface /Weather	Crash Date Time		Direction	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
TS 119	2.24	03-4688341	FIXED OBJECT TREE	WET RAIN	11/27/03/ 10:00	Veh_1 Veh_2	NE	NORMAL	VAN	Straight ahead	0	1 A	THU	DAY
TS 119	2.34	03-3551235	ANGLE	WET RAIN	08/14/03/ 21:00	Veh_1 Veh_2	SOUTH WEST	NORMAL NORMAL	CAR CAR	Driverless Skidding/Control	0	0	THU	NIGHT
TS 119	2.34	03-5149186	VEHICLE OVERTU TREE	WET CLEAR	12/03/03/ 13:00	Veh_1 Veh_2	NORTH	NORMAL	SUV	Skidding/Control	0	1 B	WED	DAY
TS 119	2.35	03-0971485	VEHICLE OVERTU	WET CLEAR	03/15/03/ 04:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Straight ahead	0	0	SAT	NIGHT
TS 119	2.36	03-2341786	VEHICLE OVERTU DITCH	WET OTHER	06/06/03/ 15:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Skidding/Control	0	0	FRI	DAY
TS 119	2.36	03-3058249	HEAD ON ~~ANGLE~~	WET RAIN	07/27/03/ 15:00	Veh_1 Veh_2	NORTH SOUTH	NORMAL NORMAL	CAR CAR	Straight ahead Straight ahead	0	3 B	SUN	DAY
TS 119	2.36	03-3513110	FIXED OBJECT GD. RAIL	WET RAIN	08/14/03/ 21:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Skidding/Control	0	0	THU	NIGHT
TS 119	2.40	03-5149293	VEHICLE OVERTU	WET CLEAR	12/05/03/ 14:00	Veh_1 Veh_2	SOUTH	NORMAL	VAN	Skidding/Control	0	1 C	FRI	DAY
TS 119	2.48	03-1980386	VEHICLE OVERTU	WET RAIN	05/02/03/ 00:00	Veh_1 Veh_2	SOUTH	NORMAL	SUV	Skidding/Control	0	0	FRI	NIGHT
TS 119	2.48	03-4688663	VEHICLE OVERTU	WET CLEAR	11/17/03/ 07:00	Veh_1 Veh_2	SOUTH	NORMAL	PICKUP	Straight ahead	0	0	MON	DAY
TS 119	2.50	03-3838848	SIDESWIPE ~~REAR END~~ SAME DIRECT.	WET RAIN	09/01/03/ 10:00	Veh_1 Veh_2	NORTH NORTH	NORMAL NORMAL	CAR CAR	Straight ahead Straight ahead	0	0	MON	DAY
TS 119	2.50	03-4688978	OTHER OBJECT EMBANKMENT (N/B)	WET RAIN	11/15/03/ 14:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Skidding/Control	0	0	SAT	DAY

ILLINOIS DEPARTMENT OF TRANSPORTATION

GIS Crash Report Details

(C) Flavin Road (Year: 2003 Only)

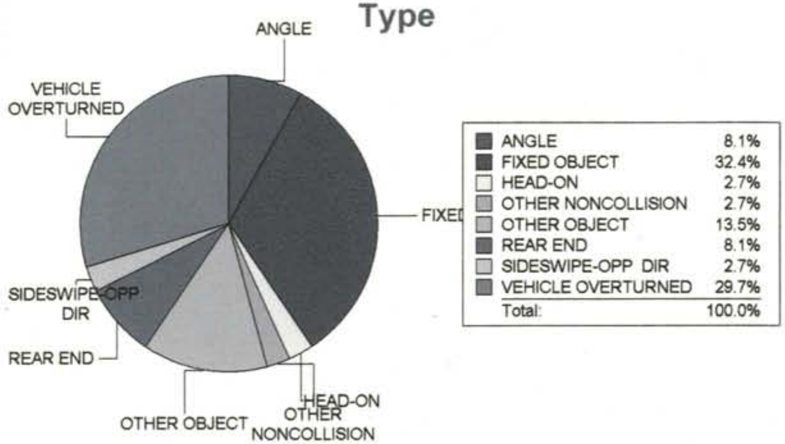
Between IL 171 & 95th Street - Animal Crashes Omitted

Route	Mile	Case ID #	Collision Type	Surface /Weather	Crash Date Time		Direction	Driver Condition	Vehcicle Type	Maneuver Code	Fatal Count	Injury Count	Day of Week	Lighting
TS 119	2.50	03-4689463	VEHICLE OVERTU	? RAIN	11/16/03/ 09:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Straight ahead	0	0	SUN	DAY
TS 119	2.54	03-0143408	OTHER OBJECT DITCH	WET CLEAR	01/06/03/ 08:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Straight ahead	0	0	MON	DAY
TS 119	2.54	03-1332745	VEHICLE OVERTU GD. RAIL	WET CLEAR	04/07/03/ 17:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Skidding/Control	0	1 B	MON	DAY
TS 119	2.55	03-3840232	VEHICLE OVERTU	? RAIN	09/24/03/ 15:00	Veh_1 Veh_2	NORTH	OTHER	CAR	Straight ahead	0	1 A	WED	DAY
TS 119	2.55	03-4380071	ANGLE	WET RAIN	10/24/03/ 21:00	Veh_1 Veh_2	NORTH SOUTH	NORMAL NORMAL	CAR VAN	Skidding/Control Slow/stop in traffic	0	0	FRI	NIGHT
TS 119	2.55	X 03-4380998	FIXED OBJECT EMBANKMENT	WET RAIN	10/03/03/ 16:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Skidding/Control	0	0	FRI	DAY
TS 119	2.56	X 03-3840364	OTHER OBJECT WENT OVER CURB	WET RAIN	09/26/03/ 22:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Skidding/Control	0	0	FRI	NIGHT
TS 119	2.57	03-3514522	HEAD-ON	WET RAIN	08/31/03/ 15:00	Veh_1 Veh_2	SE NW	NORMAL NORMAL	CAR CAR	Straight ahead Skidding/Control	0	0	SUN	DAY
TS 119	2.58	03-3058116	FIXED OBJECT TREE	WET RAIN	07/06/03/ 15:00	Veh_1 Veh_2	NORTH	NORMAL	SUV	Skidding/Control	0	0	SUN	DAY
TS 119	2.58	03-3514019	SIDESWIPE-OPP D	WET RAIN	08/31/03/ 18:00	Veh_1 Veh_2	SE NW	NORMAL NORMAL	CAR CAR	Straight ahead Skidding/Control	0	0	SUN	DAY
TS 119	2.58	03-4689430	OTHER OBJECT RAN OFF ROWY	WET RAIN	11/02/03/ 09:00	Veh_1 Veh_2	NORTH	NORMAL	CAR	Avoiding Deer	0	0	SUN	DAY
TS 119	2.59	03-3044702	FIXED OBJECT DITCH	WET RAIN	07/08/03/ 10:00	Veh_1 Veh_2	SOUTH	NORMAL	CAR	Straight ahead	0	0	TUE	DAY

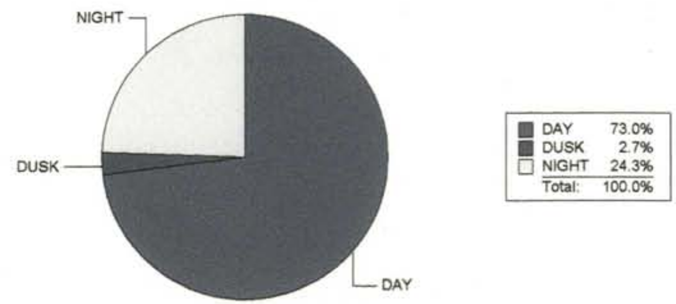
TS 11[illegible]	[illegible]	[illegible]	OTHER OBJECT INTO THE WOODS	WET RAIN	10/03/03/ 16:00	**Veh_1** **Veh_2**	NORTH	NORMAL	CAR	Skidding/Control	0	0	FRI	DAY

Total Injuries: 14 **Total Fatalities:** 0 **Total Crashes:** 37

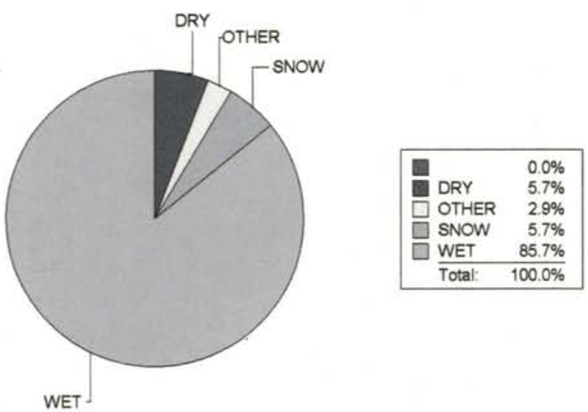
Collision Type



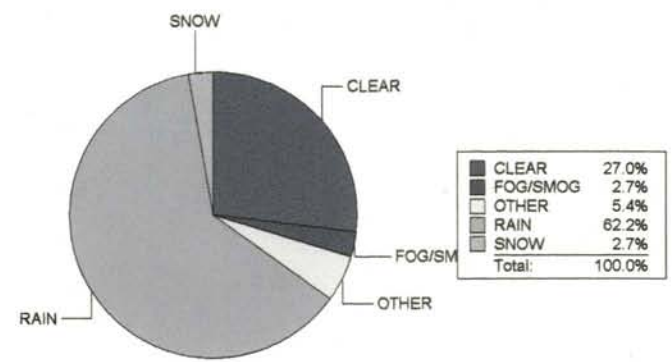
Lighting Conditions



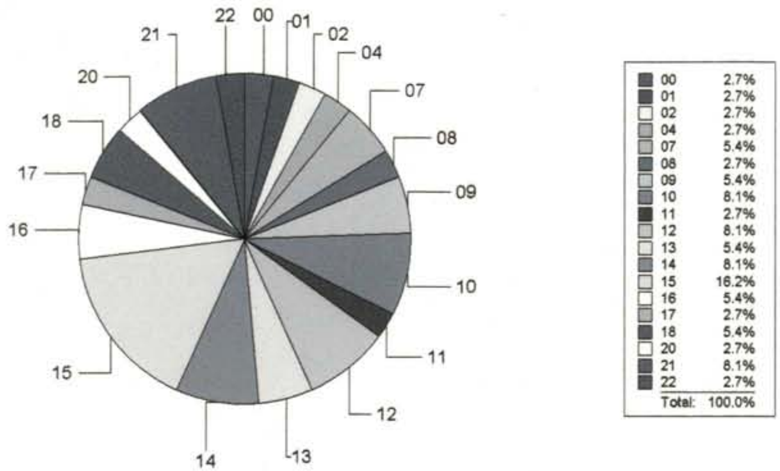
Surface Condition



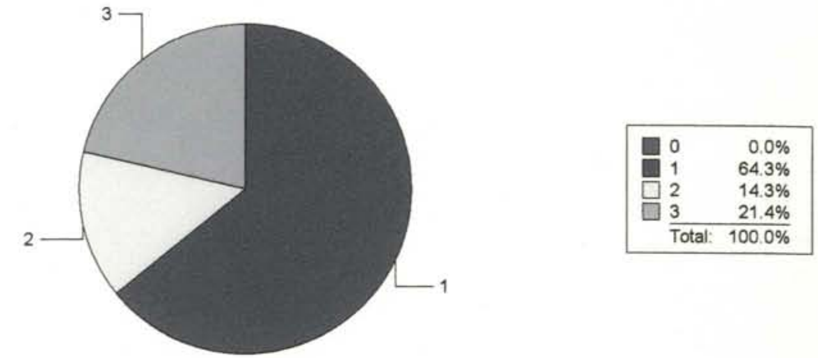
Weather Conditions



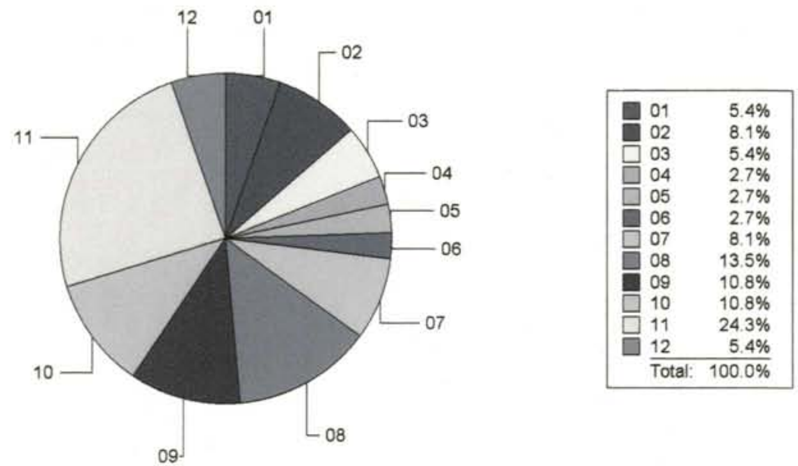
Time of Day



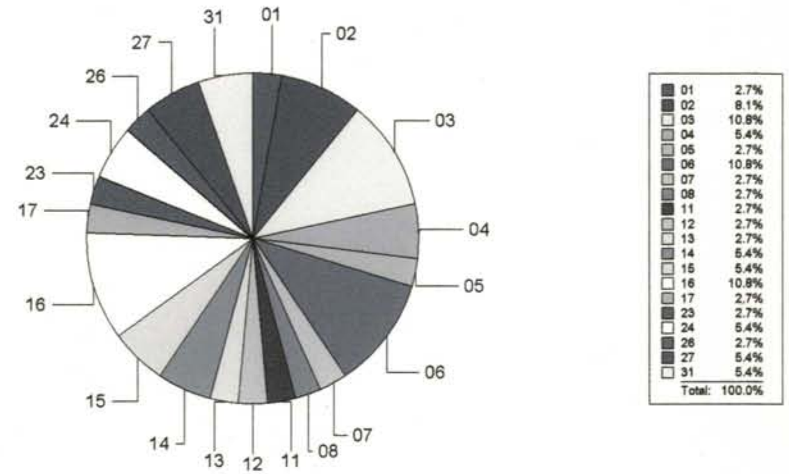
Injuries Per Crash



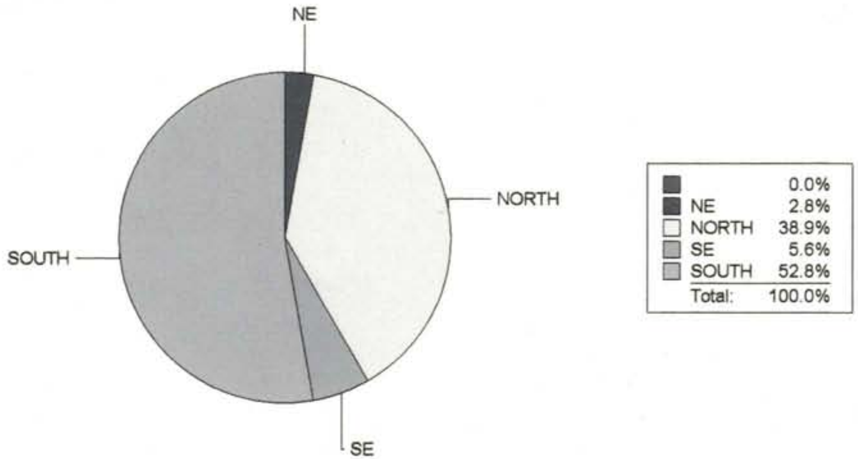
Month of Year



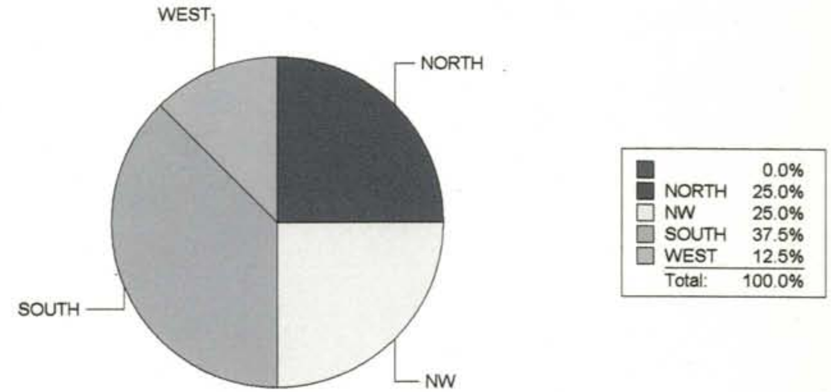
Day of Week



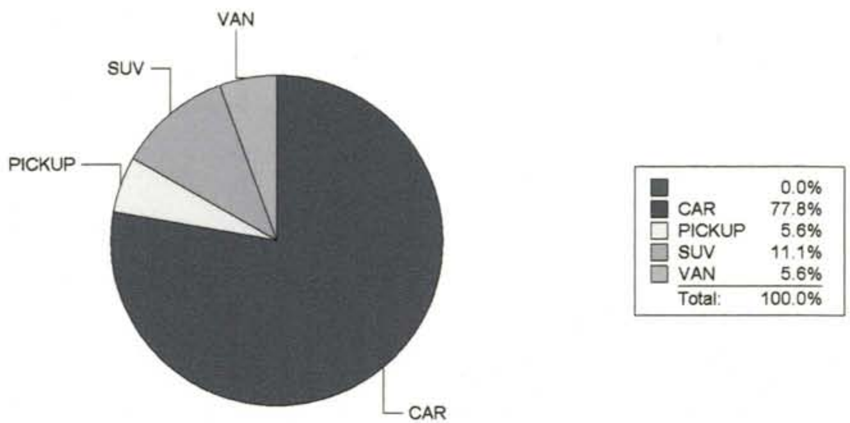
Direction of Travel - Vehicle 1



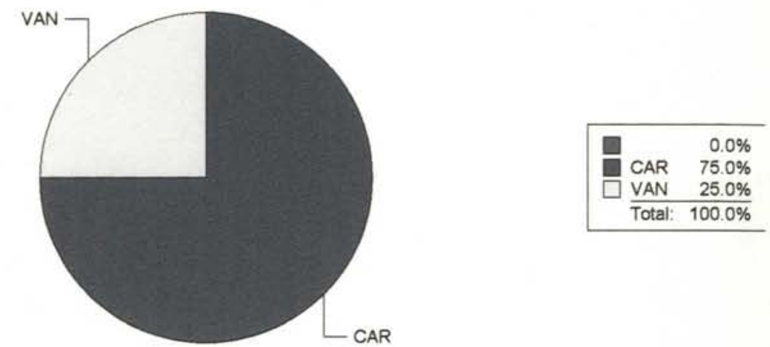
Direction of Travel - Vehicle 2



Vehicle 1 - Type



Vehicle 2 - Type



WILLOW SPRINGS RD/FLAVIN RD. BET. IL. 171 TO 95TH ST. COOK CO. 06/09/06 RZ

	2003			2002			2001				
	IDOT	WSPD	TOTAL	IDOT	WSPD	TOTAL	IDOT	WSPD	TOTAL	OVERALL TOTAL	%
ANGLE	2	2	4	1	-	1	1	-	1	6	4.6
REAR END	2	-	2	2	1	3	3	1	4	9	7.0
SIDESWIPE SD	1	-	1	1	-	1	-	-	-	2	1.5
SIDESWIPE OD	1	-	1	3	-	3	1	-	1	5	3.8
VEH. OVERTURNED	11	-	11	2	-	2	2	-	2	15	11.5
HEAD ON	2	-	2	-	-	-	2	-	2	4	3.1
OTHER NON-COLL	1	-	1	3	1	4	-	-	-	5	3.8
OTHER OBJECT	5	-	5	2	1	3	2	1	3	11	8.5
FIXED OBJECT	12	11	23	20	10	30	19	1	20	73	56.2
(TREES)	(7)	(6)	(13)	(10)	(4)	(14)	(12)	-	(12)	(39)	
(GD. RAIL)	(2)	(4)	(6)	(2)	(1)	(3)	(3)	-	(3)	(12)	
(STONE WALL)	(1)	-	(1)	-	-	-	-	-	(1)	(2)	
(DITCH/EMBANK.)	(1)	(1)	(2)	(8)	(5)	(13)	(4)	(1)	(5)	(20)	
(CURB)	(1)	-	(1)	-	-	-	-	-	(1)	(1)	
TOTAL	37	13	50	34	13	47	30	3	33	$\boxed{130}$	100%
	IDOT	WSPD	TOTAL	IDOT	WSPD	TOTAL	IDOT	WSPD	TOTAL		
WET SURFACE	30	13	43	25	9	34	21	3	24	101	77%
INJURY K	-	1	1	-	-	-	-	-		1	
A	4	-	4	-	-	-	1	-	1	5	44
B	4	2	6	7	11	18	3	-	3	27	
C	3	-	3	3	1	4	4	1	5	12	
NIGHT CRASHES	10	4	14	13	4	17	15	1	6	37	25%
% WET			86%			72%			73%		

(C) Willow Springs Rd s/o IL 171

Illinois Department of Transportation

Memorandum

IDOT Division Of Highways District One	Init.*	
Dist. Engineer		
Asst. To The D.E.		
ENG. Proj. Imp.		
Construction		
Local Roads		
Materials		
EEO		
ENG. Prog. Dev.		
Design		
Land Acq.		
Programming		A
Public Info.		
ENG. Oper.		
Elect. Oper.		
Maintenance		
Traffic		
Administration		
To:		
To:		
Asst. Deputy Sec.		
Qlty. Compliance		
Region 1 Claims		

* I = Information
A = Action

To: Mike Matkovic

From: Terry Rammacher

Subject: Cost Estimate Requests for Future Safety Projects Various Locations

Date: January 14, 2005

To assist with the preparation of Benefit/Cost ratios, please provide the Bur. of Traffic with cost estimates, for the following locations and Recommended improvements. The locations are currently identified as 2001-2003 High Accident Locations (HAL), unless otherwise noted, and are being considered for inclusion in a future Highway Improvement Safety Program:

- <u>(C) US 30 @ Ridgeland Road:</u>
  Location is not currently identified as a high accident location; however, it is experiencing a high level of severe crashes, including two recent fatal crashes in 2004, and one in 2003. It is anticipated that this will appear with the 2002-2004 HALIS run. A recent review of the intersection indicates the need for left-turn on arrow only (LTOAO) phasing for US 30. Recommendation for improvement: traffic signal modernization, and extension of left turn storage along US 30 within the existing barrier median.

- <u>(C) US 45 / IL 21 @ Pekara Drive:</u>
  Location was recently reviewed per a citizen's request. In addition to being identified as current HAL, location has been identified in past. The road segment surrounding the intersection is also identified as a 2001-2003 high accident segment. The intersection does not meet traffic signal warrants, however, the accident analysis shows a pattern of northbound rear-end type crashes at the intersection, indicating the need for left-turn channelization. Recommendation for improvement: widen the 4-lane section on US 45 / IL 21 to match the adjacent 5-lane cross-sections, north and south of Pekara Drive (approximate distance = ¼ mile section).

- (C) 183rd Street @ Central Avenue:
  Location is identified in 2000-2002 and 2001-2003 HALIS as a non-signalized high accident location. As part of a 2003 review, traffic signal warrants were met and the existing geometry allowed for the interim use of span-wire traffic signals (installed June, 2004). Recommendation for improvement: install permanent traffic signals and intersection improvement of left-turn lane tapers and pavement along 183rd Street.

- (C) Ogden Avenue @ Oak Park Avenue:
  This location is consistently identified as a signalized high accident location. Ogden Avenue currently provides two lanes in each direction with no left-turn lanes, while Oak Park Avenue provides only one lane in each direction. The accident analysis supports the need for left-turn phasing and left-turn lanes at this intersection. It may be possible to complete work within existing pavement by removing on-street parking. Recommendation for improvement: intersection improvement to provide exclusive left-turn lanes on all approaches and traffic signal modernization.

- (C) Willow Springs Road s/o IL 171: (Route 8119 from M.S 1.50 - M.S 2.60)
  In response a recent request from the Willow Springs Police Department, we conducted a review of Willow Springs Road from IL 171 south to 95th Street. It indicates a high number of crashes occurring in wet pavement conditions. Portions of this segment are identified as high accident segments, allowing for the consideration of HES funds to be used to fund a safety project. Recommendation for improvement: resurfacing of Willow Springs Road from IL 171 south to 95th Street.

- (L) Illinois 173 @ Kenosha Road:
  Location is an existing all-way stop with post mounted red flashers. Traffic signal warrants #1A, 1B, 2, 3, and 7 are met. The construction of left-turn lanes on all four approaches must precede traffic signal installation. Recommendation for improvement: channelize all four approaches and install new traffic signals.

- Illinois 173 @ Wilmot Road:
  Location is an existing all-way stop with overhead red flashers. Traffic signal warrants #1A and 7 are met. Left-turn lanes on all four approaches must precede traffic signal installation. Recommendation for improvement: channelize all four approaches and install new traffic signals.

- Illinois 120 @ Alleghany Road:
  Intersection is currently operated under 2-way stop control. Illinois 120 lacks left turn channelization at the intersection and the Alleghany Road approaches are offset. Traffic signal warrants are met in conjunction with construction of left turn lanes along Illinois 120 and realignment of Alleghany Road (or conversion of north leg to "RI-RO only" as it only serves a very small residential area north of Illinois 120). The Department has received numerous outside requests for a new traffic signal installation at this location. Recommendation for improvement: Provide geometric improvements as determined by Phase I Study/IDS and install new traffic signal.

Attached are available photos, location maps, accident history, and other relevant information for the above locations.

Cost estimates for the locations listed below were previously requested but have not been received by the Bureau of Traffic. Please provide the Bureau of Traffic with the cost estimates for the following locations:

- (C) 47th Street @ Wolf Road (requested 9/10/04)
- (C) 47th Street @ Brainard Avenue (requested 9/10/04)
- (D) Illinois 59 @ Batavia Road (requested 9/9/04)

If you have any questions, please contact Lisa Heaven-Baum, Traffic Studies Engineer, at Ext. 4135.

bcc: R. Valente
L. Heaven-Baum *lhb*
S. Bauer *SB*

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IDOT Division Of Highways District One	Init.	*
Dist. Engineer		
Asst. To The D.E.		
ENG. Proj. Imp.		
Construction		
Local Roads		
Materials		
EEO		
ENG. Prog. Dev.		
Design		
Land Acq.		
Programming	[illegible]	I
Public Info.		
ENG. Oper.	JT	A
Elect. Oper.		
Maintenance	[illegible]	I
Traffic	[illegible]	I
Administration		
To:		
To:		
Asst. Deputy Sec.		
Qlty. Compliance		
Region 1 Claims		
* I = Information A = Action		

Illinois Department of Transpo

Division of Highways/District 1
201 West Center Court/Schaumburg, Illinois 60196-1096

RT1 (C) Willow Springs Road/104th Avenue s/o Illinois 171 (Arc

November 12, 2004

John M. Carpino
Chief of Police
Willow Springs Police Department
8255 Willow Springs Road
Willow Springs, IL 60480

Dear Chief Carpino:

This is a follow up to our letter of January 27, 2004 regarding the section of roadway on Willow Springs Road/104th Avenue south of Illinois 171 (ARCHER Avenue).

As part of our review, speed studies were recently conducted on Willow Springs Road/104th Avenue between 95th Street and Illinois 171. The study results indicate the presently posted 40 mph speed limit is proper, but is being violated by 88% of the observed vehicles. A letter was recently sent to your Department requesting the provision of selective enforcement from your Department to help reduce the violation rate.

Additionally, the most recent accident data, compiled by the Department's Division of Traffic Safety, was reviewed in conjunction with your submittal of "Illinois Traffic Crash Reports." The accident analysis performed shows a high amount of crashes are occurring in wet conditions. These types of crashes are most effectively correctable with a skid-proof resurfacing of the existing pavement. The Department's current Fiscal Year 2005-2011 Proposed Highway Improvement Program does not include funding for this proposed improvement; however, the program is updated and reviewed on an annual basis. This proposed improvement will be considered for inclusion in future Highway Improvement Programs, but will have to compete with other safety and highway needs within the District.

Our review of the accident data also indicates the need to increase awareness and guidance in the curved section of roadway south of Illinois 171. To provide additional emphasis of the reverse curve near Illinois 171, the Department will install a reverse curve warning sign with a 30-mph advisory speed plate. The Department will also install a northbound Signal Ahead sign for Illinois 171 and will renew and relocate any existing signs where applicable. All overhanging brush within State right-of-way will be trimmed to increase visibility of the warning signs. These improvements will be completed as our workload allows.

If you have any questions or need additional information, please contact David A. Ziesemer, Bureau Chief of Traffic, at (847) 705-4141.

Very truly yours,

Diane M. O'Keefe, P.E.
District Engineer

By:
Jacek Tyszkiewicz, P.E.
Engineer of Operations

bcc: J. Tyszkiewicz
M. Matkovic
J. Stumpner
D. Ziesemer
T. Rammacher
L. Heaven-Baum
S. Bauer

Prepared By: Susan Bauer, Ext. 4426
Bureau of Traffic

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8/27/04

Illinois Department of Transportation

Division of Highways/District 1
201 West Center Court/Schaumburg, Illinois 60196-1096

ST 3.3 (C) 104th Ave.

August 27, 2004

Chief Sam Pulia
Willow Springs Road
8255 Willow Springs Road
Willow Springs, IL 60480

Dear Chief Pulia:

As part of a periodic review program, a traffic and engineering speed study was conducted on 104th Ave. in Willow Springs between 95th Street and IL 171 (Archer Ave.) to determine the appropriateness of the existing speed limit.

The study results indicate the presently posted 40 mph speed limit is proper, but is being violated by 88% of the observed vehicles. In addition, the 40 mph speed zone has sections of roadway and an intersection that were designated as high accident locations. This information is being provided to assist you in your program to provide selective enforcement.

Copies of the speed data sheets have been enclosed for your information.

If you have any questions or need additional information, please contact our Data Collection Technician, Rodger Neubert, at (847) 705-4091.

Very truly yours,

Diane M. O'Keefe, P.E.
District Engineer

By:
Terry A. Rammacher, P.E.
Arterial Traffic Operations Engineer

Enclosures

Illinois Department of Transportation

Sign Shop Work Order

SS Sign Shop

Special Instructions

☒ Signs ☐ Pavement Marking

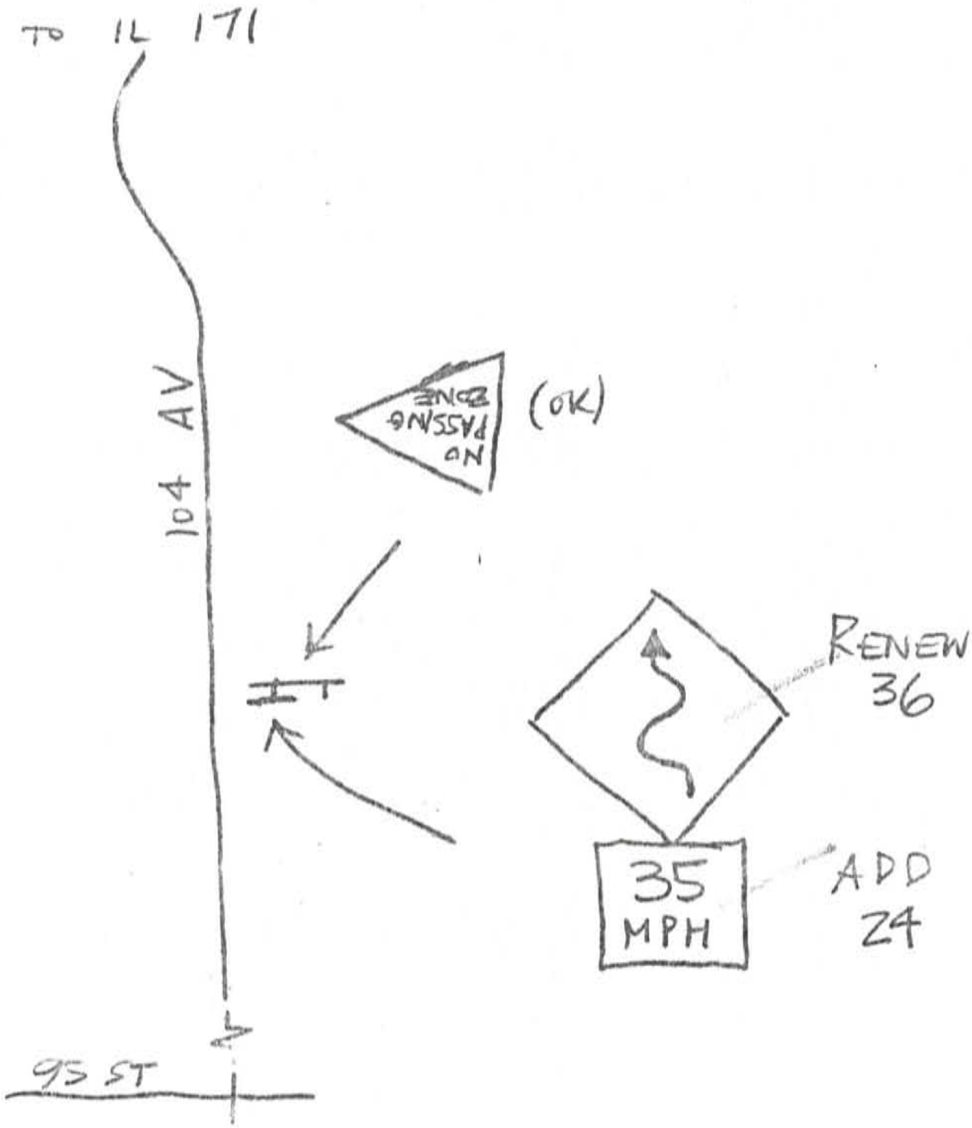
☐ Delineators ☐ ____________

Location: 104 AV – FLAVIN RD

0.42 ft. Mi. N S E W of at 95 ST

City WILLOW SPRINGS County COOK Sign facing traffic: NB SB EB WB

North



Field Engineer: Smith K	Reviewer:	Work Crew:
Date Logged: 10-08-04	Date Reviewed:	Date Completed:

Sheet 1 of 1 Work Order # SK-2004-M324

IL 494-0715 MAI 2206 D-1 (Rev. 3/91)

Illinois Department of Transportation

Sign Shop Work Order

SS Sign Shop

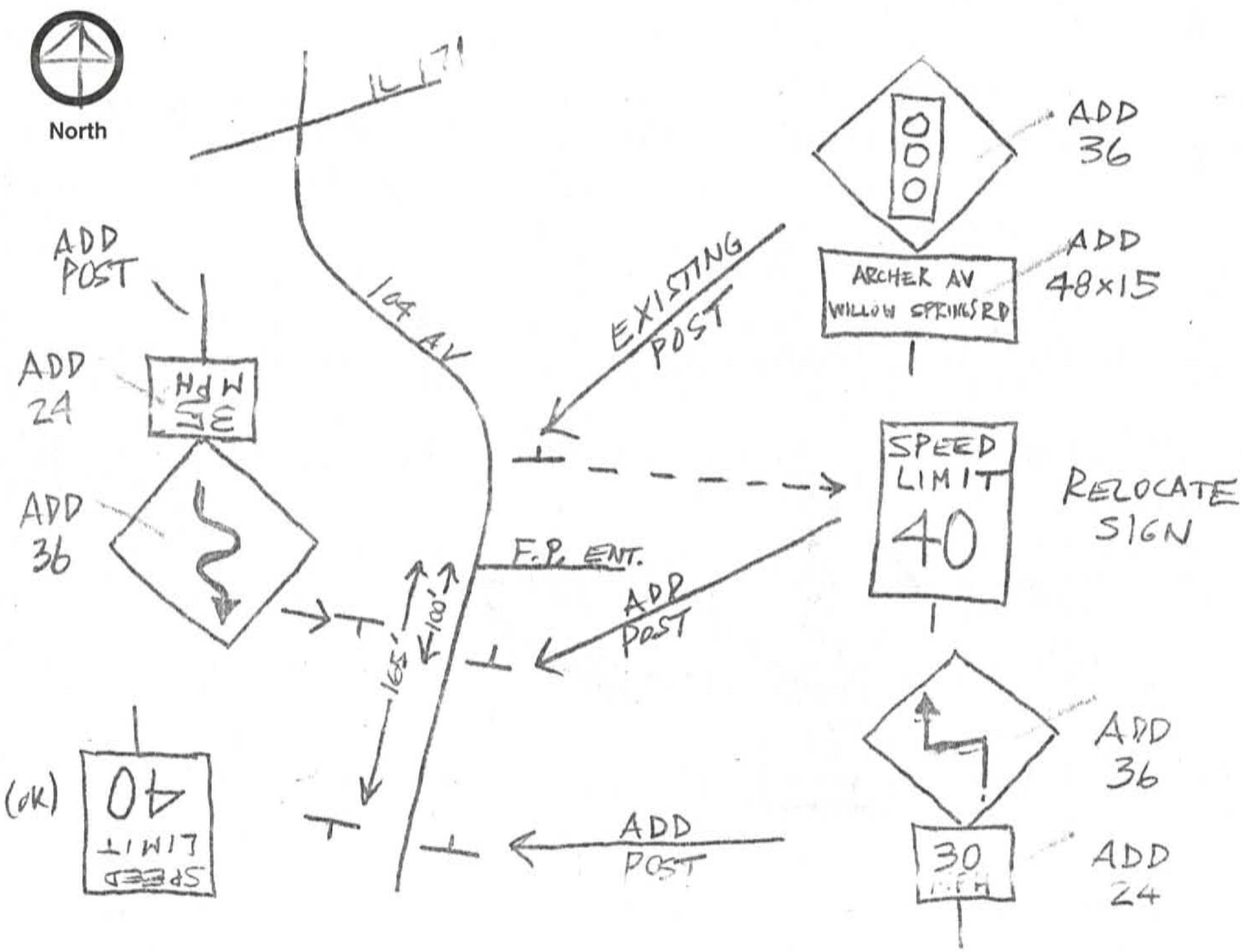
Special Instructions: ASAP

- [x] Signs
- [ ] Pavement Marking
- [ ] Delineators
- [ ] ____________

Location: 104 AV – FLAVIN RD

________ ft. Mi. N (S) E W (of) at IL 171 (ARCHER AV)

City WILLOW SPRINGS County COOK Sign facing traffic: (NB) SB EB WB



Field Engineer: Scott K	Reviewer:	Work Crew:
Date Logged: 10-08-04	Date Reviewed:	Date Completed:

Sheet 1 of 1 Work Order # SK-2004-M325

IL 494-0715 MAI 2206 D-1 (Rev. 3/91)

Illinois Department of Transportation

Sign Shop Work Order

SS Sign Shop

Special Instructions

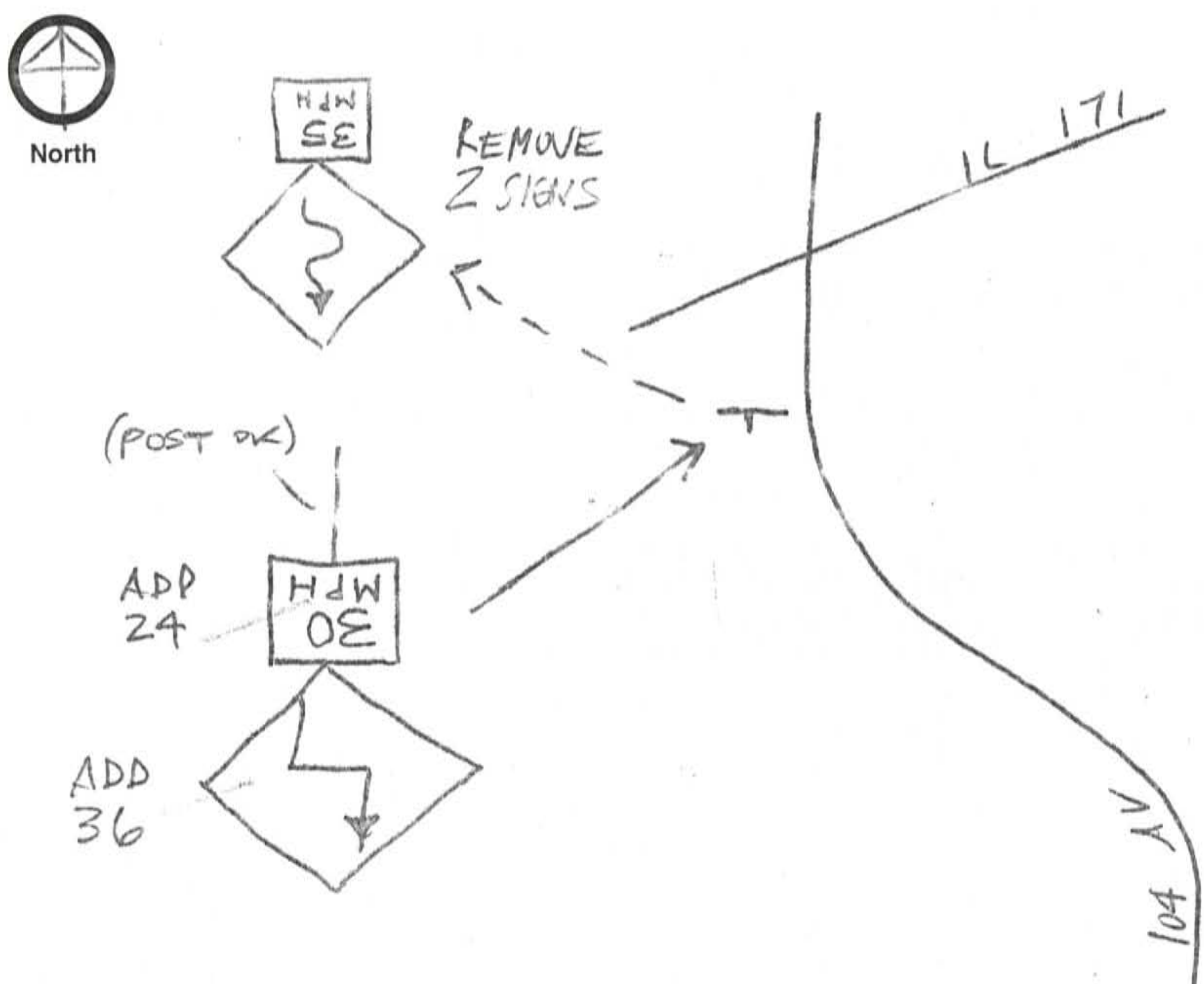
☒ Signs ☐ Pavement Marking

☐ Delineators ☐ ____

Location: 104 AV – FLAVIN RD

____ ft. Mi. N S E W of at IL 171 (ARCHER AV)

City WILLOW SPRINGS County COOK Sign facing traffic: NB SB EB WB



Field Engineer: Smith K	Reviewer:	Work Crew:
Date Logged: 10-08-04	Date Reviewed:	Date Completed:

Sheet 1 of 1 Work Order # SK-2004-M326

IDOT Division Of Highways		
District One	Init.	*
Dist. Engineer		
ENG. Proj. Imp.		
Construction		
Local Roads		
Materials		
EEO		
ENG. Prog. Dev.		
Design		
Land Acq.		
Programming		
Public Info.		
ENG. Oper.		A
Elect. Oper.		
Maintenance		
Traffic		I
Administration		
To:		
To:		
* I = Information A = Action		

Illinois Department of Transpo

Division of Highways/District 1
201 West Center Court/Schaumburg, Illinois 60196-1096

(C) Willow Springs Road/104th Avenue S/O IL 171 (Archer Aven

January 27, 2004

Chief John M. Carpino
Chief of Police
Willow Springs Police Department
8255 Willow Springs Road
Willow Springs, IL 60480

Dear Chief Carpino:

This is in response to your letter regarding the section of roadway on Willow Springs Road/104th Avenue south of IL 171 (Archer Avenue).

Per your request, the Department will perform a traffic study along this portion of State-controlled roadway. As part of that study, the Department will review your submittal of Illinois Traffic Crash Reports, in conjunction with the accident data compiled by the Department's Division of Traffic Safety, to determine if any changes in traffic control are warranted. You will be informed of the results of the study upon its completion.

If you have any questions or need additional information, please contact David A. Ziesemer, Bureau Chief of Traffic, at (847) 705-4141.

Very truly yours,

John P. Kos, P.E.
District Engineer

By:
Jacek Tyszkiewicz, P.E.
Engineer of Operations

bcc: J. Tyszkiewicz
D. Ziesemer
L. Heaven-Baum
S. Bauer
Reading File

Prepared By: Susan Bauer, Ext. 4426
Bureau of Traffic

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JOHN M. CARPINO
CHIEF OF POLICE

SAM D. PULIA
COMMANDER

(708) 839-2732
ADMINISTRATIVE PHONE

FAX (708) 839-3024

8255 WILLOW SPRINGS ROAD
WILLOW SPRINGS, IL 60480
www.willowspringspolice.org

District Engineer John Kos
Illinois Department of Transportation
201 West Center Court
Schaumburg, Illinois 60196-1096

Re: Willow Springs Road South of Archer Avenue

12 January 2004

Dear Mr. Kos,

I have been on-the-job as Chief of Police for the Village of Willow Springs since December of 2002. I recently retired as the Deputy Chief of Police with the City of Oakbrook Terrace.

Since working in Willow Springs I have discovered numerous motor vehicle crashes on Willow Springs Road South of Archer Avenue. Just recently we handled three (3) rollover crashes on this stretch of roadway and I know of one (1) fatal crash.

I have compiled all motor vehicle crashes on this portion of roadway for the past five (5) years and would like your office to review this for your direction.

I am requesting a roadway analysis and a traffic study if possible to assist this agency.

Recently the sign shop has offered to erect warnings signs to the North and South end of Willow Springs Road in the area that is of concern. After a slight rainfall the roadway becomes more of a problem and on many occasions causes a motorist to loose control and either strike a tree, guardrail, or rollover.

Please feel free to call me if you have any additional questions or concerns regarding this matter of mutual concern. Thank you for your time and assistance.

Sincerely,

John M. Carpino